The Builder.

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The Inquest on the Bradford Chimney Accident.

IN our last will be found the report of the conclusion of the inquest on this lamentable and discreditable accident, and of the verdict thereupon returned, a verdict which, read in connexion with the evidence, amounts in reality to little more than a naïve confession on the part of the coroner's jury of their inability to understand the facts of the evidence, and their consequent desire to avoid the responsibility of expressing any decided opinion upon the cause of the accident. The weakness and futility of such a vague verdict only shows anew the incompetence of average coroners and juries to deal with such questions. The coroner was, indeed, supposed to be assisted by the advice and co-operation of Lieut.-Colonel Seddon, R.E., who was sent (very properly) by the Home Office to represent the skilled opinion and judgment on practical building questions so seldom represented among the ranks of a coroner's jury trying a case of this kind. All who remember Colonel (then Captain) Seddon's important paper read some years ago at the Institute of Architects, on "Our Knowledge of Building Materials," will feel sure that he was a most competent adviser on such a subject; and the nature of the questions which he put to some of the witnesses shows pretty clearly which way his opinion tended. But Colonel Seddon might as well have spared himself the trouble, as far as influencing the verdict was concerned. The coroner, indeed, thanked him, it appears, for the trouble and interest he had taken in the case, but there the legal appreciation of the engineer's assistance seems to have ended. It was well, however, that the Home Office took the step of sending down a professional expert, as, though it does not appear to have had any influence on the verdict, some of the evidence elicited by him had a material effect in bringing out the true facts of the case for those who could appreciate them.

Let us take a critical view of the history as far as revealed by the evidence. The whole of the details of the evidence, it is true, are not before the public; the condensation of the evidence in the daily papers is obviously full of inaccuracies, but a large proportion of these are of such a nature that it is easy to conclude in most cases what was really said or implied by a witness, after correcting for the various distorting media,—the witnesses' unskilled English, the reporter's misunderstanding of the point of the question, or the occasional evident mistakes in telegraphy (as "strengthening" for "straightening," and so on). To begin at the beginning, we find at the outset the late proprietor taking, as he did in some subsequent stages, the initiative in a by no means fortunate manner. He found signs that the ground proposed for the site had been previously disturbed, a discovery which would have led most people who knew anything of the matter to hesitate considerably about placing such a great weight upon it, and to think it desirable to look for another site. Sir Henry Ripley's conclusion seems to have been the reverse: here was so much saving, the principal foundation shaft already sunk, and merely wanting to be cleared and repacked. Of course, it was assumed that this was merely a ready-made shaft where one would have had to be made otherwise; but that the ground had been much cut up and pulled about is apparent from the evidence. No man in his senses, who knew anything of the possible effects of heavy weight upon foundations, would have chosen such a site for the purpose if he could have got another. That this was the opinion of the two persons concerned in the inquiry who were best qualified to judge, Colonel Seddon and Mr. Waugh, is evident from the reply of the latter to the examination by the former, to the effect that "an old coal-pit would certainly not have commended itself to his mind as a suitable site upon which to erect a chimney intended to be 100 yards high and 4,000 tons in weight, although the shafts were sunk and filled up with cement. If he had had to build a building there he would have started to erect it from the seating of the coal. The difficulty of packing old coal-workings was notorious." The proprietor, however, appears to have had a very obedient set of people round him, and "they all fell in with Sir Henry's opinion," Mr. Andrews, the architect, included, that this old shaft was a kind of indication of Providence for the site. The old shaft and the new ones that were sunk at the angles, were not, however, "packed with cement," but with a concrete of lime and stone, and engine-ashes: a good foundation for a moderate weight. But we can easily appreciate the point of the question put by Colonel Seddon to Joseph Moulson, the foreman who superintended the works:—"Taking the lowest calculation of 4,000 tons as the weight of the chimney, do you think it is safe to put on common lime-concrete a weight of five tons per foot?" "Yes, if the concrete is properly made and the ground not loose." "Would you consider it safe to put half as much again on that bed of concrete,—seven tons and a half per foot?" "I should." Now, considering that Mr. Kirkaldy has found seven tons to the square foot the crushing limit of ordinary well-made mortar (one lime to three sand), and that the security of the lime-concrete foundation must depend very considerably on the resistance of the lime-matrix to crushing pressure, these questions and answers are rather significant. Upon the top of these five columns of lime-concrete descending into the honeycombed ground came a platform of concrete, 2 ft. 6 in. thick. We hear nothing in this case of cement-concrete either; we are left to infer that it was the same lime concrete as in the shafts. If so, that was certainly not a thick enough template (for that is what it essentially was, in intention, at least) to distribute the weight. But what we wanted to know was, how long *after* this foundation was made was the building commenced? In the published reports we can find no evidence on that head; yet that is most important. With concrete made as described, and intended to bear so great a weight, some months should have been allowed to elapse for thorough consolidation and hardening, before a stone of the chimney was laid. For anything we can find to the contrary, the work was proceeded with as soon as the first setting of the packing or concrete had taken place. Mr. Waugh's evidence certainly was that the packing beneath the ground-line was, when examined after the fall of the chimney, "as solid as a rock, and had to be quarried out." Very likely, after it had been there for years with the weight of the chimney upon it. But in the first instance we have the starting of the chimney on a template of apparently new lime-concrete only 2 ft. 6 in. thick, supported on new lime-concrete legs going down into ground that had been cut about and disturbed by coal-workings. The packing was not rammed, but was "occasionally levelled." A chimney of great weight and thickness is carried up seventy yards from this base, and is found at that height to be leaning three yards from the perpendicular. One witness suggested vaguely that it might have been sent out of plumb by some bad workmanship in setting, in the course of building. That appears to be simply nonsense; it is evident that the builders and their *employés*, however innocent of general principles some of them may have been, understood their practical work considerably better in some ways than any of their employers. It would have taken far more careless work than could possibly be expected from fairly good workmen to have put the chimney as much out of plumb as that. The foundations had given way on one side, as Mr. Morpeth, the clerk of the works, seems to have said at the time. That it should give way, considering the nature of the site chosen and the way it was treated, was what need have surprised no one; had it not done so at all, it would been a piece of good luck, rather than anything else.

The recent fall of the chimney did not, however, arise directly from any defect in the foundations. They had settled to their bearings

long before. But it was from the insufficient and badly-chosen foundation that the mischief first began. It was owing to that result that the owner and those who were working for him found themselves with a leaning chimney seventy yards high on their hands. But before we come to this point we must look at what had passed in regard to the construction of the chimney. It was to have an ashlar stone face, rubble stone backing behind that, and a brick lining behind that, with a separate unbonded inner ring of fire-brick, allowed to expand and contract freely with the variations in temperature when in use. The exterior face was to be octagonal. Before the chimney was commenced, the builder's clerk of works, who seems to have known what he was about, suggested that the fire-brick and red-brick linings were too light, and that red-brick ought to be substituted for the packing. He obtained permission from his employers, Messrs. Moulson, to make this suggestion to the owner. "Sir Henry replied that he thought the packing ought not to be dispensed with." Whether this is the blunder of the reporter, or the witness's misuse of English, we do not know, but it would convey to the ordinary reader the erroneous idea that Sir Henry was standing up for a superior mode of construction. The fact was obviously the reverse. The clerk of works was suggesting a safer and more expensive construction, and the owner insisted that the packing would do, but seems to have accepted Mr. Morpeth's criticism so far as to suggest a thickening of the brickwork to 18 in. for the lower part of the chimney, and 14 in. for the upper portion.* As there was to be rubble packing, this thicker brickwork was certainly better than the 9-in. lining which appears to have been at first intended. It was a stronger jacket for the packing, and afforded opportunity for better tying, if this had been taken advantage of properly, which it does not seem to have been, but it is needless to say to any practical reader that the packing system is one of the worst that can be adopted when it is a question, as it was here, of making a thoroughly secure and steady walling, the lower part of which was to sustain great weight, and the whole of which eminently required stiffness and cohesion. How bad it is, the history of some of the Mediæval cathedrals, with their packed and cased piers, can tell. If this plan, however, were adopted to save some of the expense of a great amount of coursed brick or stone work, the mortar should at least have been of the best, and the stone casing and brick lining should have been connected by occasional strong through stones, going right through the backing. We have the evidence of Mr. Waugh, however, that the mortar found adhering to the stones which had formed the backing, or "hearting," was of inferior quality to that used in the inner and outer casings, it had not been riddled, and contained many large lumps. Here, then, was a chimney, 80 yards high, with a stone shell and a brick shell with no through connexion, and packed between with rubble "of the sort generally used in dry walling," and with mortar of an inferior description, and which had evidently not formed a homogeneous mass. Ought any one to feel surprised that such an erection should show a tendency to bulge, to throw off its outer skin, even without the system of pulling about to which it was subjected to straighten it? Mr. Moulson, the contractor, seems, indeed, to have been pretty well aware of this. Some of the practical witnesses, however, seem to have had the most confused ideas as to the constructive relations of the different thicknesses of the chimney. Nearly every one was agreed that the outer ashlar casing was no support to the chimney, and might be pulled about and removed *ad lib.*, this case being the only outer confinement of the rough rubble of the backing. Another witness thought the backing contributed nothing to the strength of the chimney, and that it all depended on the brick lining, which would have stood by itself. Some of the witnesses, in fact, seem to have regarded the construction as "not one chimney, but three chimneys," built up within each other for purely accidental or sentimental reasons. We should certainly not have liked to risk the brick lining alone, but we do think that in all probability the brick lining with the exterior ashlar, if carefully laid and bonded, would have been a more stable construction without the intervening thickness of rubble padding. It is of no use to add mere thickness to a chimney or a pier to strengthen it unless the addition be made in a workmanlike and scientific manner; otherwise it may be little better than so much extra weight hung on. Mr. Moulson put this plainly and well in his evidence. "He was still of opinion that the chimney would have been much stronger if either brickwork or inside wall stones had been used throughout instead of packing. He was of opinion that no stone chimney of such a size ought to have been built as this chimney was built. . . . . The weak point in packing was its uneven character, and he should consider that a chimney in which packing had been adopted would be more likely to be disturbed by the rocking action of the wind than if it were a brick chimney." This is plain practical common sense, and it appears that Mr. Moulson and his foreman were precisely of the same mind on the matter. This was in the witness's examination by Colonel Seddon, and it seems curious that in his previous examination by the coroner he had admitted to having ultimately agreed with the owner that with the increased thickness of brickwork the chimney would be strong enough with the packing. But another bit of his evidence gives the explanation. It is evident that the late Sir Henry Ripley, whatever his admirable qualities, was one of those wealthy and genial, but positive, Englishmen, who will have their own way, even in managing matters which they do not understand. All the discussion about this important question of the construction of this great chimney was settled by the owner with the builders without any professional adviser, — architect or engineer. When the chimney was about ten yards up, it seems to have occurred to Sir Henry for the first time that the architectural effect of the chimney ought to be considered, so "he got designs for holes and panels" (!). Witness, his father, and Mr. Morpeth protested that these adornments would weaken the chimney, but Sir Henry smiled, and said, 'You must do it my way.'" Were not the occasion so serious, we might also smile at this delightful example of the average English gentleman's notions of the way of making architecture by getting "designs for holes and panels," and the average capitalist's reply to the arguments of men who knew more about the matter than himself,—"You must do it my way."

Unfortunately, not being men with the responsibility attached to professional standing, they did do it "his way" in everything. They laid the foundations in an old coal-working with unequal bearing, to please Sir Henry; they built the chimney with backing, which they knew was an insecure construction; they made "holes and panels," which they declared weakened the structure, and a "Steeple Jack" from Manchester came and put the finishing touch by cutting the chimney and preparing it for its future fall,—and all to please Sir Henry. For in this latter case, too, it is stated in the evidence that Woodman "convinced Sir Henry that he could make the chimney perfectly straight, and with Sir Henry's consent he cut through the chimney in two places on the side opposite to which it leaned." No architect or engineer was consulted; "Sir Henry" and the "Steeple Jack" settled it between them. We do not emphasise this fact with the desire of making unkind reflections on the memory of Sir Henry Ripley. We do it in the faint hope that some other "Sir Henrys" (they are a race well known to architects) may take warning from the lamentable consequences in this case, and not think that because they are large capitalists and have some shrewdness, they can dispense with skilled advice and please themselves by carrying out important constructions "their way," to the possible detriment of the lives and limbs of their fellow-men.

The doubtful fitness of the chimney-doctor for his task in this case is proved by the fact that, although he himself said, according to the evidence, that the chimney had gone at the foundations, he proceeded to set it right by a cut 18 yards up its height. Independently of the crushing action of the chimney when brought over, such a course was the very way to leave a bend and a tendency to bulge in the chimney at that spot. How, after such an operation at that point, the chimney could have "looked perfectly straight" to any eye, it is difficult to understand, unless Mr. Waugh's suggestion be the true explanation, that the foundation having canted, in the first instance, the weight of the chimney coming over after the wedges were withdrawn canted it back again. The chimney-doctor, however, could never have counted on the foundation behaving in so obliging a manner, and if he had, matters would have been still more against him, as it would have been obvious that such a movable foundation was a thoroughly unfit one, and might just as well have canted again: that it did not do so would have been mere luck.

The chimney was cut, however, a number of the half-throughs broken (as a matter of course) in its settling over, and under the influence of wind-pressure and disturbance at that point the cohesion of the external masonry was further weakened, while the ill-mortared rubble within it, now with no bond at all to the inner and outer skins of masonry and brick, began to bulge the outer skin. Once the bulge began, it was bound to increase, as on the ashlar facing once losing plumb and opening its joints, there was no tie to counterbalance the force of gravity tending to drag it away from the hearting. Its fall was only a question of time.

We come now to the third stage of the inquiry, in regard to the extent of foresight and care taken to guard against the worst results. At the outset of this portion of the evidence we come across the "Steeple Jack" again.

The second witness called, the solicitor to the trustees of the late owner, stated that the chimney "had been examined twelve months before"—by an architect, by an engineer, by any man of standing and responsibility? Oh dear, no!—"by a man called 'Bill the Greaser,' who would be produced. He could not say when or by whom the chimney had been otherwise inspected." We looked in vain, however, through the report of the subsequent evidence for the appearance of "Bill the Greaser." He does not seem to have come on the scene. Some sixteen or seventeen years ago, according to another witness, part of the outer case bulged in four places. It does not seem to have occurred to any one to consider why it bulged; the bulges "were an eyesore," however, and the witness (one of Messrs. Moulson's masons) took them out and put in new masonry. According to the account of Mr. Haley, the steward to the trustees, he could not remember that any repairs had been done to the chimney for many years. The flues were cleaned once in eighteen months, but no other kind of inspection was made. He noticed cracks in the chimney from time to time, and pointed them out to Sir Henry Ripley, who "thought them of no importance." At last, on the morning of December 20th, this witness "saw daylight through a bulge," and he then seems to have thought it was time to do something decisive, and sent for Mr. Humphries, "a man he had great confidence in as a practical builder." Mr. Humphries said the facing was coming away from the backing, but it did not matter, as the facing was no support to the chimney. True, perhaps, if the backing had been coursed brickwork, but even then there should have naturally occurred to this "practical" man the question, what made the facing come away? Stones do not move from their beds without a compelling force of some kind. As it was, the backing was hanging upon and dragging down the whole structure, a fact of which the forcing away of the outer casing was but a sign. The history of the remaining few days is astounding to read. Quantities of masonry were falling from the chimney day by day, the workpeople were evidently, from the evidence given by some of the survivors, under the greatest alarm; and yet none of the persons who were properly responsible seem to have shown any anxiety about it. The statement of the mother of a poor lad who was killed, how she had reassured her son as to the danger, telling him that his employers "would not allow them to work there if there were real danger," was pathetic to read after the accident. The poor woman seems to have reckoned without her host, nor can we for our part in the least pretend to understand the apparent indifference in regard to the imminent danger which overhung the unfortunate *employés*. There seems to have been plenty of anxiety in regard to some persons. The solicitor, Mr. Little, begged one of the partners, who was his son-in-law, not to go near the mill or the chimney while the bulge was being removed; but he does not seem to have extended his fatherly advice to recommending any care for the safety of the "hands"

* According to one witness, however, the interior brickwork consisted only of 9-inch red brick and 9-inch fire-brick; a discrepancy in the evidence of which we find no explanation.

in the mill. Horses were removed from the vicinity; one partner in an adjoining mill insured his life; so there must have been an extensive anxiety and sense of danger, but no one thought of stopping the mill for a few days to keep the "hands" out of danger. The day before the chimney fell Mr. F. Ripley said to Mr. Greenwood, "So you have insured your life because of the chimney?" and on receiving an affirmative, said, "Oh, it is not going to fall yet." This is a grave matter, and we think such a reply can only lead to one of two opinions: either the speaker was very stupid, or he was reckless as to the safety of those who had to work for him; one or other conclusion is inevitable. The attitude of Mr. Andrews, the architect, is alike inexplicable to us, except on the supposition that he had not personally been able to pay much attention to the construction or history of the chimney.

Comparing the verdict with the weight of the evidence, it appears that a chimney of this kind may be built according to the fancies of a non-professional owner, whose object would naturally be economy (more or less); that its first failure may be corrected in a most unscientific way by a chimney-doctor who had never before applied his method to any but brick chimneys; that it may show such unmistakable signs of danger for a week before its coming down as to cause general remark and apprehension in all who are obliged to be in its neighbourhood, without any move being made to place them in security; that it may fall and kill over fifty of them; that an engineer may give positive evidence that the previous construction and treatment of the chimney had been such as almost absolutely to insure such a catastrophe sooner or later; that the contractor at work on the repairs was afraid to trust his men under it; and that no blame attaches to any one! "Is that law? Ay, marry is't; crowner's quest law."

The Bradford jury have given their verdict; we beg to give ours, as follows:—We are of opinion that the chimney fell in consequence of inadequate and unscientific construction, acted upon in the most detrimental manner by an operation of cutting the chimney, carried out without proper and skilled professional advice; and that this operation was first rendered (in a sense) necessary by the subsidence of the foundation owing to a very bad and ill-judged choice of site. We consider that very grave responsibility attached to the original owner for having caused the erection of a chimney with these defects and this unsatisfactory and unstable construction. We further consider that in view of the obvious warnings of danger which the chimney gave for a week preceding the disaster, the carelessness of the owners in allowing their workpeople to continue in the mills under such circumstances is strongly to be condemned.

It is to be hoped that no more large chimneys will be built or looked after as the Bradford chimney was, and that owners who think they can do all these things for themselves and without proper advice and direction will take a lesson from this tragical history.

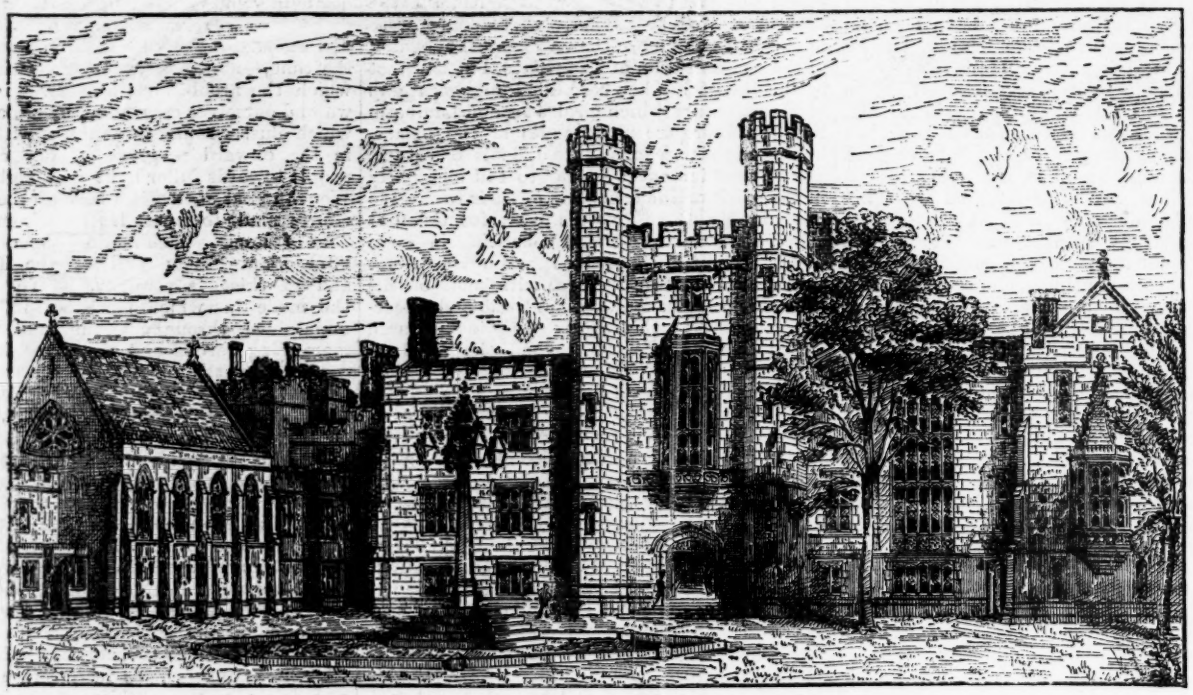
LAMBETH PALACE AND ITS ASSOCIATIONS.

AMONG the few and decreasing number of ancient buildings which London and its immediate vicinity still is able to point out, Lambeth Palace occupies a peculiarly prominent position. The Great Fire left in London little of the ancient and the picturesque, the hallowed and the historical, behind it, unharmed by its fiery ravages. It is true that we have, in or near the City boundaries, the Tower and the Temple, St. Bartholomew's Church, with its marvellous apse, a few crypts and other portions of early churches, some bits of Roman wall, some old rooms at the Charterhouse, and a few houses elsewhere. Many of these have been photographed by the "Society for Photographing Relics of Old London," and for cheapness and excellence of the plates the Society deserve every praise. But all these antique edifices and relics must fain yield in point of magnitude and of historical association to the palace of our archbishops, which forms the subject of the work* to which we propose to direct the attention of our readers on this occasion. It would not be, therefore, unreasonable if the student of Mediæval London architecture were to expect to find more than a few works devoted to the consideration of the palace, but the fact is that the author has here filled up a great gap in the literature which circles around Lambeth. Not that there are no accounts of the palace, but those that are extant are difficult to procure, and in most instances appear to fail singularly in the spirit or the execution of their task. We have, in Mr. Cave-Brown's book, for the first time, a readable history, consisting in main of facts carefully examined and verified, not taken, as is so often the case with books of this class, from haphazard, second-hand, and uncertain sources; it is this feature of original research which raises the work beyond the level of ordinary topographical antiquarianism. During a period of nine years' residence in Lambeth, the author cherished his love of literary research, and made a practice of collecting every little particle of information from history, architecture, archæology, and art, bearing upon his favourite subject, while the vision seems to have constantly floated before him that he might, at some future time, be enabled to mould his gathering into shape, and so write the history of the place he had learned to love. But many years were destined to intervene between that period and the production of the work, and twenty years of Indian life were to be spent before he found himself standing in his old haunts, and found too, that "though Lambeth Palace had passed into other hands, its portals were as widely open to him as before, and even greater facilities and encouragement were offered to him for carrying out his long-cherished wish." Then it was that he set himself strenuously to the task of arranging and digesting the data which he had previously accumulated, and to add to them from every available quarter. The principal authority who had recorded his labours on the subject was Dr. Andrew Ducarel, at one time keeper of the Lambeth Archives, whose "History of Lambeth Palace," the author admits, has been, and ever must be, the basis of all subsequent histories of the site. Denne, Nichols, Herbert and Brayley, Allen, Tanswell, and others, have in turn written, from their several points of view, upon the history of the palace, but of their productions some are obsolete and others antiquated, whereas in the volume before us the author avows his aim to "tell the tale of Lambeth, or rather, to make those historic portions of it which belong to days gone by tell their own tale" down to the present day, so that the general reader, as well as the architect and archæologist, may find an account intelligent and trustworthy, as far as he can make it, of what Lambeth Palace has been, and what it is now. Identifying himself, as he passes from place to place, with the spot which he is examining, his desire has been to carry the imagination of his reader with him, labouring throughout to portray, with all possible certitude and truth, the personages, the characters, and the actions, as far as possible, of the distinguished men who for many centuries have from time to time in succession found a home or a prison, or even signed a document, or assisted in a consecration at Lambeth Palace. Conscious that he was,—the author tells us,—bringing forward many details of the history which had been hitherto unnoticed, and in some cases endeavouring to refute local traditions of general acceptance, he felt called upon to justify his statements, and therefore, at no little personal labour of research, he has striven to trace up every statement to its fountain-head, in order to give his authority for making it, and to verify every reference given by other writers before becoming himself responsible for it.

The late Archbishop, in his short introduction,—almost the very last literary labour in which he was engaged,—gladly calls attention to the book, and records his confidence that Mr. Cave-Brown will be found to have collected a larger number of historical facts relating to Lambeth Palace than has yet been published in any available form, while the skill with which these copious materials are arranged and edited, speaks for itself. He trusts, and we may cordially echo the sentiment, that the gates of Lambeth Palace will ever be readily opened to all who take an interest in its history, and in the work which centres within its walls. We may quote a single paragraph from the introduction, which eloquently and vividly indicates the archbishop's feelings of reverence and veneration for this historic pile. "Even if we confine our thoughts to the time,—now nearly seven centuries,—during which the archbishops have lived in Lambeth, we find ourselves connected, by the associations which cluster round these walls, with each step in the onward progress of our church and people towards fuller light and higher liberty. We can find memorials here of the successful efforts made to secure freedom from the thraldom of Rome, which marked the reigns of the later Plantagenets, and of the Lancastrian and Yorkist sovereigns. We can trace the mode in which Christian influence was maintained throughout the land in spite of marauding barons and rapacious kings. We can see how the professed followers of Christ bore themselves amid the struggles preceding that great upheaval of society, in which the hitherto non-privileged classes asserted their rights as Englishmen. We learn how the Church of England, notwithstanding the grave faults of many of its rulers, adapted itself,—under the good hand of God,—in all these troublous times, and in the changing days which followed them, to the real wants of the English people. The admonitions of places are, to the student of history, as powerful as the admonitions of books. Men's hearts may well be stirred, and their loyalty to the National Church confirmed, as they trace the many memorials in the architecture, pictures, and ornaments of Lambeth, which bring them face to face with the past, and so arouse their high hopes for the future."

The inquiry into the manner whereby Lambeth Palace became the residence of the Archbishops of Canterbury, nearly seven centuries ago,—since which time exactly fifty prelates have occupied the see,—naturally preceded other questions in the history of the palace itself. The author's researches on this point indicate that the palace owes its position mainly as a memorial of a great struggle with the Papacy, and as a material evidence of the early assertion of the championship of the rights of the English people against Papal usurpation. The contest which had been carried on between the Archbishop and the monks of the Priory Church at Canterbury led eventually to Archbishop Baldwin resolving to have a chapter of secular canons outside the city, and independent of the monks, and to set up among them a residence for himself, where he might be free from the interference of the regulars. Hackington, or St. Stephen's, near Canterbury, was first selected, but it was abandoned on account of its proximity to monastic influences, and the site of Lambeth, though at first equally obnoxious to the monks (who anticipated a lessened influence of their order), by whom some of its first buildings were destroyed, gave, —under the powerful hand of Hubert Walter,— a substantial and permanent dwelling for himself and his successors. Little appears to be known of Lambeth in Saxon times, beyond the confirmation, in 1062, of the manor to Waltham Abbey. According to the evidence of Domesday book, this manor belonged, with many others, to Goda, the Countess, sister of Edward the Confessor, and wife, successively to Walter, Count of Maine, and Eustace, Count of Boulogne. Goda appears to have granted the manor to the Bishop and Convent of Rochester, but it soon passed back to the Crown. William II. restored it to Rochester, and from these owners it passed to the ownership of the archbishops of Canterbury. Of the derivation of the name there appears to be little doubt, the word being a compound of *lam*, Saxon for loam, or mud (a word found curiously enough also in the Portuguese language, *lama*), and *héé*, *hithe*, or *hythe*, the haven, or landing-place: hence the word Lambeth apparently signifies "the muddy landing-place," a title, no doubt, then, as now, significant of its condition. There is, however, room for conjecture that there may have been some connexion with the Celtic word *Llan*, a sacred enclosure, or *Lamprey*, with which the River Thames abounded at this point, and of which the number of 500 were charged to be sent yearly from this manor to the Bishop of Rochester. It is, nevertheless, impossible to assign even an approximate date to the original building of the palace; the crypt,—undoubtedly the oldest portion of the building now remaining,—does not contain any architectural portions to which a date can be attributed before the beginning of the

* "Lambeth Palace and its Associations." By J. Cave-Brown, M.A., Vicar of Detling, Kent, and for many years Curate of the Parish Church of St. Mary, Lambeth. With an introduction by the Archbishop of Canterbury. With illustrations. (William Blackwood & Sons, Edinburgh and London, 1882.)



Main Courtyard Entrance, Lambeth Palace.

thirteenth century, but the author thinks the roof of the crypt may point to a rather earlier period than 1245, the date of Boniface, who was called on to repair or re-build the edifice. It is probable that this archbishop raised the present chapel over the already-existing crypt, and perhaps,—as suggested by Ducarel,—laid the foundation of the great hall. In the early years of the reign of Henry VI. Archbishop Chicheley erected his tower, and repaired other parts of the building, which had by his time become somewhat extensive. Later on Cardinal Morton erected the present gateway, and at a subsequent period the ill-fated Cranmer is said to have built the small tower at the north-east of the chapel. But the aggregate result of successive additions to the domestic portions of the primate's residence was found to be without system, order, or regard to comfort, until Archbishop Howley, who succeeded to the dignity in 1828, while preserving with appreciative reverence, and carefully restoring all that was really ancient and historic with zeal and taste, swept away the patchwork jumble of more recent dwelling-apartments, and substituted, at very considerable private expense, the present handsome range of buildings, which form one long line eastward from Cranmer's Tower, and present, both in the main court-yard,—of which we give a view,—and in the garden, an imposing battlemented frontage, effectively broken by irregular projections of bay-windows and oriels, and relieved by turrets.

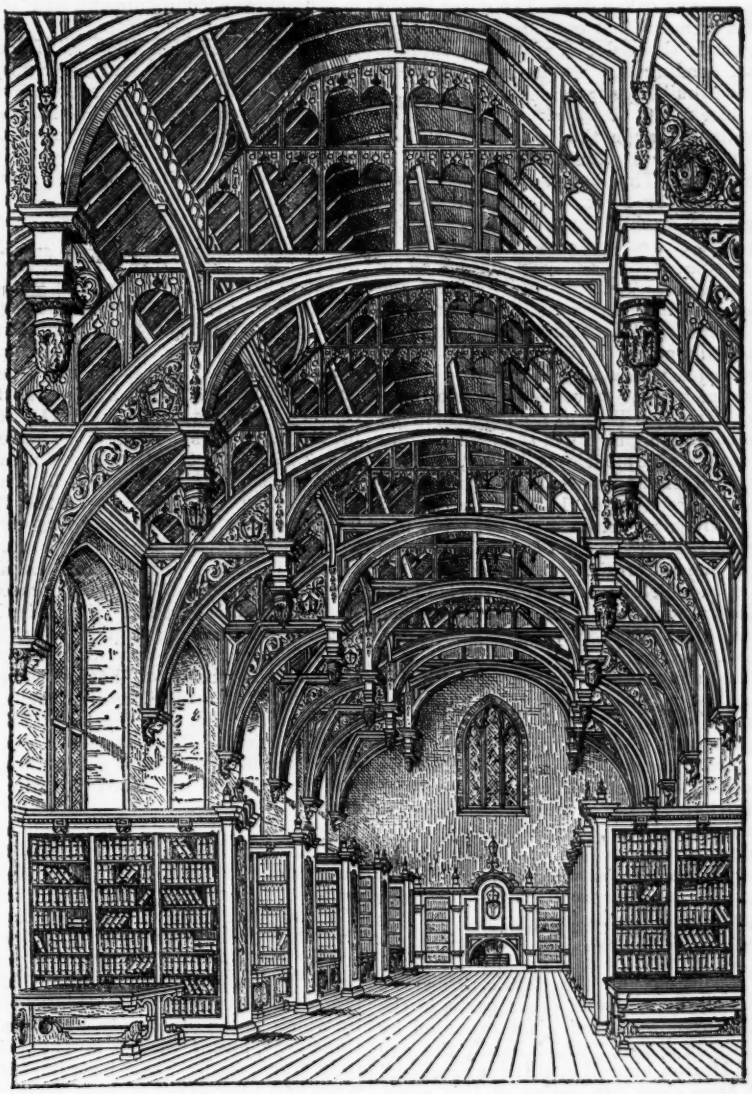
Of the great gateway, or "Morton's Tower," opposite, in all probability, to the *pons*, or water-stairs, and on the site of an older gate, much has been written by the author. Of it the author says, "This stately yet somewhat sombre pile of buildings, red brickwork, with stone quoins and dressings, forms no unworthy portal to an archiepiscopal palace; scarcely can England produce a finer specimen of the early Tudor style of brick building in so good a state of preservation. Indeed, in size and height, in massiveness of character, and harmony of design, Morton's Gateway may almost claim to be without a contemporary rival." He contrasts it with the earlier and more decorated specimens at St. John's College, Cambridge, Layer Marney Hall, Essex, and Oxburgh Hall, Norfolk. The great hall on the eastern side of the outer court is an important member of the palace. It is now commonly called Juxon's Hall, and used as a library. The light for the centre of the room is obtained from five lofty windows reaching from within a few feet of the ground to the cornice, and lying deeply recessed between buttresses, while two end bays, containing broader and longer three-light windows, project into the yard like wings. The entrance is through a small doorway under the arch which leads to the main courtyard. The room measures nearly 100 ft. in length, 50 ft. high, and 38 ft. broad, and the book-cases, filled with a valuable collection of books and manuscripts, line the sides and project at regular intervals in the room. Here again we have no authoritative record of the original building, but the mention of the "Magna Aula" at the beginning of the fourteenth century clearly points to such a building, in which consecration banquets were customarily held, and possibly some councils, convocations, and high commissions. Archbishop Juxon spent nearly 15,000*l.* in repairing the palace, of which the hall absorbed two-thirds. The roof, —which is well shown in the accompanying illustration, — possesses considerable architectural beauty. The massive projecting hammer-beams, with upper and under braces, are to be referred to the Plantagenet era, but while the original lines of construction have been preserved, the more elegant adornments have given place to the round lathe-turned bosses, which like the large balls or globes that do duty for finials on the walls outside, betray a tardy and reluctant concession to the intrusive demands of the Renaissance. The lantern on the centre of the roof carries a vane charged with the heraldic bearings of the See of Canterbury, and of the Juxon family impaled. The date of 1663 appears on the leaden gutters under the cornice. The library contains many thousand volumes, the nucleus being formed by Archbishop Bancroft, who, according to Aubrey, acquired a large portion of his library from that of Robert Dudley, Earl of Leicester, the once powerful favourite of Queen Elizabeth. To these were added the archiepiscopal registers, beginning in date from A.D. 1279, the period of Archbishop Peckham. The value of these registers is enhanced by the state papers, wills, bills, and miscellaneous political documents which they embrace. The miscellaneous MSS. include no less than seven series named after their original possessors; but it would be impossible to follow Mr. Cave-Brown into his lengthy notice of the collection. We may only point out the MS. "De Virginitate," by Aldhelm, Bishop of Sherbourne, a work belonging in point of date to the eighth century, of which some believe that the illustrious Alcuin, the friend of Charlemagne, was the actual scribe; the "Gospels" of Mac-Durnan, Abbot of Derry and Bishop of Armagh, in the ninth century; the Sarum Missal, once the property of Archbishop Chicheley; the printed Mazarine Bible, believed for a long time to be a manuscript; and the transcript of Anselm's works by the historian William of Malmesbury.

Mr. Cave-Brown devotes a most interesting chapter, of considerable dimensions, to the numerous portraits which adorn the guard-room or dining-hall, on the site of the ancient *camera armigerorum*, significantly placed between the Great Hall and the private apartments, as a means of protection and defence for those whose sacred office could not always, as in the cases of Stratford's narrow escape in 1340, and Simon de Sudbury's fate in 1381, secure them from the lawlessness of a rabble. Changes and restorations have done much here to the room; the floor has been raised and several internal details modified; the portraits ranged around the room do not indicate much variety of dress at first sight, but the careful observer will find a great deal of illustration of ecclesiastical costume if he compares the details of the portraits. The original and probably faithful portrait of the nobly-born Cardinal Pole is remarkable for the distich which is inscribed along the bottom of the picture; the imperfect condition of the second line (p. 131), should not be difficult of emendation. The biographical anecdotes which the author has introduced into this part of the work are exceedingly interesting. They are written with evident feeling and judgment, and form, perhaps, the best literary feature in the work. The portrait ascribed to Katharine Parr, the last of the six queens of Henry VIII., which hangs in the private dining-room, is disallowed by the author, who adduces evidence in favour of its being a representation of Katharine Howard, first wife of Lord William Howard, afterwards first Lord Howard of Effingham, and sister-in-law of the unfortunate queen, Katharine Howard. She died in 1535. A brass effigy of this lady, it is worth while to note, is still in its place in the adjoining parish church.

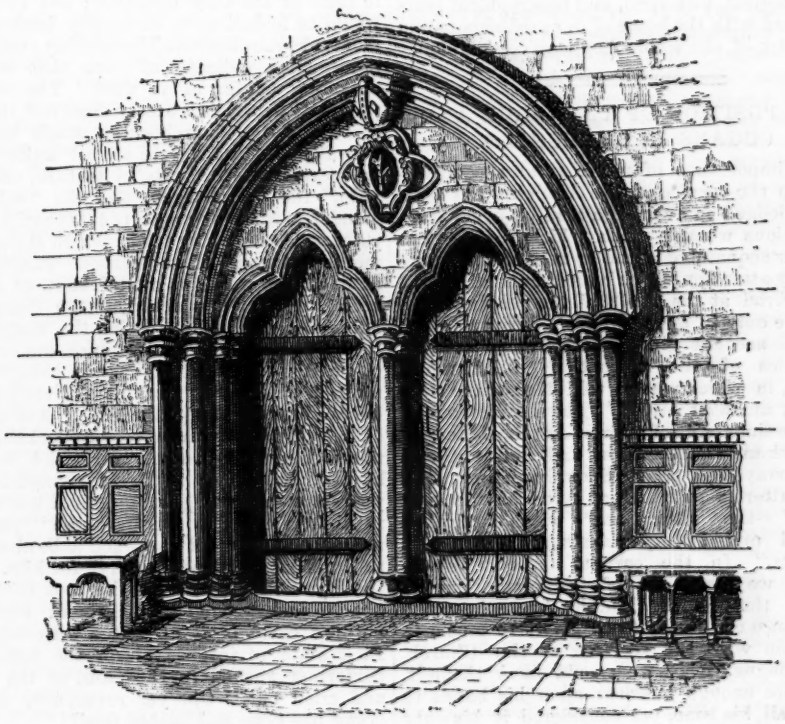
Another point which Mr. Cave-Brown elucidates is the Water Tower, commonly called the Lollards' Tower. To this latter title he asserts that it has no right, either in whole or in part. The central part indicates, by the details of its architecture, a date of the earlier half of the fifteenth century, and the arms of Archbishop Chicheley, on a shield borne by an angel, confirm the record in the Steward's accompts that this tower was erected by that primate, and completed in 1435. A square abutment close by is attributed to the close of the twelfth cen-

tury, forming, perhaps, a part of Hubert Walter's original building. The turret, if we may trust our author, massively constructed with oaken planks and of primitive carpentry, with wooden bolts, and showing marks of the ancient adze and saw, was standing in Chicheley's time, and utilised by him, but it is impossible to fix the exact age of this edifice; it may, however, be questioned if this old turret is not the most ancient part of the palace, and entitled to bear the honour of age away, even from the chapel crypt itself. The third portion of this tower is to be referred to the period of Archbishop Laud. It consists of a spacious staircase, by which the chambers in the tower could be reached more conveniently. The author discusses the causes of this tower being called the "Lollards' Tower" with much acumen, pointing out that no antiquary of the sixteenth or seventeenth century,—not Leland, Speed, Spelman, or even Aubrey,—and no historian of the period, speaks of any Lollards' Tower at Lambeth. The only one they knew was that attached to London House, and really forming a part of Old St. Paul's. Even in the days of the Republic and Commonwealth, when Lambeth Palace, and especially this portion of it, was converted into a political prison, the tower still retained its original designation of Water Tower. The author explains the later and erroneous application of this term here by the excited condition of theological feeling, which set up a welcome invention that was immediatedly accepted as having the impress of unquestioned tradition. Attached to Chicheley's Tower was one apartment undoubtedly constructed for use as a prison, and but a slight effort of popular imagination, already at fever heat, was requisite in order to transfer to Lambeth, without a thought or scruple, all the obloquy that had been poured out upon the veritable "Lollards' Tower" at London House. But if there be no record of Lollards having been incarcerated in this part of the palace, these Lambeth prisons held other inmates from time to time, and in the seventeenth century were crowded with victims, not of Papal persecution and tyranny, but men whose loyalty to Church and Crown drew upon their heads the remorseless vengeance of a revived and exaggerated Lollardism. There yet remain names and sentences cut into the oaken panels of the small room at the top of the staircase turret, and on the stone walls in the small dungeon in the basement of Morton's Gateway, and these have been pointed out as evidence of the confinement of Lollards here, but the character of the writing, the Latin sentences (of which, by the way, it is to be regretted that Mr. Cave-Brown has not given some specimens or facsimiles), and the sacred monograms indicate an education and cultus very different from that usually ascribed to the Lollards; and if it be true that the shapes of the letters belong to the seventeenth century rather than to the fifteenth,—a point not difficult to set at rest if the inscriptions were before us,—there can be no doubt that these effusions must belong not to the Lollards, persecuted by a fanatic church, but to Royalists, who suffered here for conscience sake.

The remaining feature of interest which yet remains for us to notice briefly is the chapel, the restoration of which has been voted, on the motion of Earl Stanhope, only a few days ago, to be completed by way of national memorial to the late Archbishop of Canterbury. On the occasion of the proposition being made, at an influential meeting held in the Egyptian Hall of the Mansion House, the noble earl stated that as regarded "the restoration of this chapel, it was a work of love which had commended itself to the late archbishop, and on which he had engaged in remembrance of a lost wife and a lost son. It was a work," he said, "which had been dear to the late primate, and it was a work which, on that account, they now sought to complete." The date of the chapel, as indicated by the western doorway and lancet-windows, may be fairly attributed to the middle of the thirteenth century, probably almost contemporaneous with the nave of the Temple Church, with which it closely corresponds in character. But it is difficult to say that this is the original chapel erected on the spot, the crypt, with its boldly-groined arches, being doubtless of earlier date. The record of early consecrations at Lambeth may perhaps refer to the parish church, or to the Bishop of Rochester's chapel at Carlisle House, but not to the Palace chapel. In this crypt it was that in 1536 Anne Boleyn was summoned before Cranmer the day after her condemnation, under circumstances too well known to need repetition here. The entrance doorway of the chapel, which forms the third illustration of this notice, is of striking character, and of somewhat unusual construction. It led from a raised terrace running along the west end. Here a semicircular, or rather a slightly pointed, arch, with deep and massive mouldings belonging to the Early English period of architecture, embraces two smaller trefoiled or cusped arches, each of which was



The Great Hall, now the Library, Lambeth Palace.



Entrance Doorway to Chapel, Lambeth Palace.

closed by a heavy oaken door. The outer jambs consist of a series of four columns gradually receding towards these doors, and their capitals and bases, bonding the whole into the main wall of the buildings, are each cut out of a solid block of Purbeck marble. The central pillar between the two doors is composed of a cluster of three Purbeck shafts in the same style. The chapel's dimensions are 72 ft. in length by 25 ft. in breadth, divided into four bays, each lighted by three lancet windows, splayed and enriched with shafts of Purbeck marble; the western bay divided off by a screen, to form an ante-chapel; the east end lighted by a graduated row of five lancets with Purbeck shafts. A corresponding group of lights originally occupied the western end. The various changes which this thirteenth-century edifice has undergone have been carefully recorded by Mr. Cave-Brown, among which we may refer to the stopping up of the west window by the erection of Chicheley's Tower, and the introduction of stained glass by Cardinal Archbishop Morton, repaired in 1634 by Laud, and demolished by his Puritan enemies, who, like Prynne, spied the introduction of a crucifix in what was simply the restoration of the scene of the Crucifixion, in which he drew upon the subjects of the illustrations found in a book entitled "Imagines Vitæ, Passionis, et Mortis N. D. Jesu Christi," printed by Boetius a Bolswert in 1623. The associations connected with the chapel are, as might naturally be supposed, numerous and varied. They range in Mr. Cave-Brown's pleasantly and elegantly written work from the arraignment of John Wickliffe, before Archbishop Sudbury in 1378, and the consecration of Matthew Parker at the commencement of Queen Elizabeth's reign, the life of Parker, the dashing of the stained glass out of the windows by Cranmer, the memorials of the ill-fated Laud, Sancroft's vain attempt to organise an independent church inaugurated by his "Nonjuror" Communion, the sacrilegious destruction of Parker's tomb by the Puritans, Juxon's reparation of the fabric, Howley's renovation of the roof and other parts, to the introduction of new stained glass executed by Messrs. Clayton & Bell, "which hardly the age or taste of Morton himself could have excelled." We must here close our notice of this work, which will be found by those who take an opportunity of perusing it to be a worthy exposition of a worthy theme, and embracing in a fairly moderate compass a vast collection of archæological, historical, and biographical facts connected with the home of our archbishops and the centre of the whole Anglican communion.

THE POSITION OF THE CHOIR AND ORGANS IN CHURCHES.*

The importance of music as an accompaniment to the service of the Almighty has been acknowledged in every age and by every form of religious worship with which history has made us acquainted; and to realise the extraordinary attention which this branch of sacred art received at the hands of the people of old, we have only to open the Holy Scriptures and read the account given in the Second Book of Chronicles of the dedication of Solomon's Temple, in which we are told that there were present, amongst others, "the Levites which were the singers, all of them of Asaph, of Heman, of Jeduthun, with their sons and their brethren, being arrayed in white linen, having cymbals and psalteries and harps, stood at the east end of the altar, and with them an hundred and twenty priests sounding with trumpets." In the earliest days of Christianity we also read of "singing hymns," and all through the Middle Ages the same importance continued to be given to music in connexion with the services of the Church. Charlemagne, who, we should have thought, had quite enough business upon his hands to occupy all his time, yet considered it his duty to become acquainted with the discussions going on as to the correct number of the Gregorian "modes" or tones to be used in church music; and Robert, king of France, absolutely conducted the choir of his royal chapel, arrayed in his coronation robes!

Although the Eastern Church also cultivated music, yet there was a great divergence of practice; the Western Church admitting the use of instrumental accompaniment, and the Eastern Church strictly prohibiting it. However, it should be noted that the use of instrumental accompaniments is not, and never was, universal even in the West, and it is a well-known fact that 'neither organ nor orchestra has ever been admitted into the Pope's own chapel, the Sistine, nothing but pure vocal music being allowed. I believe also that the Cistercian and several other religious orders are forbidden by their rules to have anything but vocal music in their churches. Until some twenty-five years back instrumental accompaniments were forbidden in the diocese of Lyons, and the Roman Church still prohibits the use even of the organ at high mass on the Sundays of Lent and Advent.

Long before the Reformation, most large churches in England possessed one or more organs. Durham Cathedral in the fourteenth century had as many as five. The Reformation in England does not seem to have had any perceptible effect upon church music, and in most cases the organs remained. The case was very different, however, with the Revolution. The Puritans seem to have vented their spite upon organs more than on any other article of church furniture except alone the altar, and a very lively account of their proceedings at Peterborough is given in "Mercurius Rusticus," but which is too long to quote here.

To the German Lutherans, however, must be allowed the credit of having developed the organ into the magnificent instrument which it has now become, and the immortal genius of John Sebastian Bach has given a literature to the instrument such as is possessed by no other, and is scarcely surpassed by the orchestra itself.

Ecclesiastical music had fallen into a very low condition in this country some forty years back, and those who are old enough can well recollect the state of things which then existed. The cathedral choirs were, of course, an exception, but even in cathedrals the organs were totally inadequate, few of them possessing a properly-arranged pedal-board, and all of them tempered according to the wretched old system, by which music could only be played, in about three keys, and if written in any other it had to be transposed. These instruments, however, often had a fine effect of tone, from their position upon the choir-screen. The organs in parochial churches were, as a rule, dismal affairs. It is true that a few organs by Father Smith, Renatus Harris, &c., were to be found in some of the City churches; but even these would be looked upon as totally inadequate to modern requirements, although they undoubtedly possessed a delicacy of tone that was very charming as far as it went. The choirs in parochial churches scarcely deserved the name, and in village churches the music was often ridiculous. Organs were almost unknown, and the terrific instruments of torture, the "seraphin," the barrel-organ, and the "self-acting grinder," were amongst the favourite substitutes. The shocking tricks which these instruments played often caused consternation amongst the worshippers. I knew of a "self-acting grinder" which had the disagreeable habit of occasionally treating the congregation to the whole of its twelve tunes, one after another, if by accident the man in charge did not make a rush at it and hit a certain knob or button just at the right minute. And a friend of mine related to me a very remarkable scene at which he was present, and which happened at a village church in Buckinghamshire many years ago. A hand-grinding organ was the hero in this case. The "professional" performer upon the instrument happened to be absent, and an amateur undertook to serve for him. When the hymn was given out he took hold of the handle and ground and ground away, but nothing came of it all but a wheezing sound. In a state of intense alarm the unfortunate performer rushed to the front of the gallery and cried out, "Oh, yer reverence, this 'ere organ has gone and busted itself!"

The old village orchestras, which may possibly have been of value in earlier times, had died out or dwindled away until they had become worse than useless. I recollect a very old clerk in a church near Norwich, who used to lead the singing with a cracked clarionet, and I remember his telling me that many years ago there was a full band, of which he was the only survivor. As, however, he told me this nearly thirty years back, and he was then over eighty, probably the band had been given up sixty or seventy years ago.

The very remarkable revival of ecclesiastical music in this country during the past thirty or forty years, and the wonderful development of the organ during the same period, have of necessity had an effect upon our ecclesiastical architecture and the arrangement of churches and chapels; for, wonderful as has been the improvement of the musical arrangements in Anglican churches, it has been equally remarkable amongst Congregationalists and Dissenters generally. In years gone by a hymn bawled in unison was considered sufficiently artistic in places where now one will hear first-rate choral singing, accompanied by a very excellent organ. Oratorios and organ recitals are also greatly favoured by our Nonconformist fellow-countrymen, who are doing much for the development of musical taste in connexion with religious worship.

In the Roman Catholic churches of Germany a somewhat remarkable movement has taken place in connexion with ecclesiastical music. It is the abandonment of the orchestra and the orchestral style of composition, of which Mozart and Haydn were such notable masters; and the revival of the earlier and severer or vocal style which is exemplified by the magnificent compositions of Palestrina, de Lasso, and Soriano. The disappearance of the orchestra is leading to increased importance being given to the organ. Pugin complained some thirty years back that when the choir struck up in Cologne Cathedral, with its orchestral accompaniments, the columns and arches of the building seemed to disappear, and to become replaced by the pit, boxes, and stage of the Italian Opera. He would find no cause for that complaint now, as the operatic singing is replaced by the severest church compositions, and the orchestra has been abolished, and is about to be replaced by the largest church-organ ever erected. This movement has now spread so far in Germany that in addition to the cathedral of Cologne it has been adopted in those of Ratisbon, Mayence, Aix-la-Chapelle, Münster, Eichstadt, Treves, Leichtmeritz, &c.

I have been obliged to dwell upon these musical facts at some length because they serve to show that the organ is every day becoming a more and more important adjunct to religious services, and during the last thirty years the progress which has been made in organ-building, and the enormous improvement which has taken place in everything connected with that instrument is a remarkable fact in the history of music. Those who compare the organs erected half a century back with the magnificent instruments constructed by our leading English firms at the present time are simply astounded at the ingenious inventions and contrivances which have been introduced to overcome difficulties which rendered the older organs generally almost unplayable, and always most fatiguing to the performer. It must not, however, be forgotten that the more perfect the organ is the larger its bulk becomes, and the greater becomes the difficulty of the architect in finding a suitable place for it in a church or chapel.

In Mediæval times, and, in fact, as a general rule, until some thirty or forty years back, the organ gave an architect little trouble. As long as it was inclosed in a case some 10 ft. by 5 ft., and about 16 ft. high, it could be placed almost anywhere, and it did not demand consideration in planning a church; but when the same thing becomes a structure 20 ft. square and 30 ft. high it can no longer be ignored, and provision must be made for it or *it* will become a serious disfigurement to the building. The difficulty must be boldly grappled with. It is simply useless for an architect to complain of the size of an organ or to suggest that it should be made smaller, so as to occupy less space; he might just as well complain of the size of a dining-table when he is designing a dining-room. The thing is wanted, and must be provided for, and the architect must discover some means of meeting the difficulty. I acknowledge that it is often a serious difficulty, but there is not the slightest chance of its vanishing or even becoming modified, as in all probability organs will get larger and larger as time goes on. All attempts at decreasing their size have hitherto proved complete failures.

There are, of course, several things to be taken into consideration in selecting the position for an organ. The first, and most important, is that the instrument should be placed where it will be heard to the best advantage. The

* A paper by Mr. H. W. Brewer, read before the Architectural Association on the 2nd inst., as elsewhere mentioned.

second is that it should be in such a situation that it may be serviceable both for the choir and also for congregational singing. The third, that it should be placed where it will be secure from injury arising from damp, excessive draughts, variations of heat and cold, and, especially, leaky roofs: the gutter of a roof should never, under any circumstances, be carried over an organ; yet, in two new churches which I have lately seen the organ is placed under the valley between two roofs. In another church, recently restored at great expense, I noticed a few weeks since that the gutter over the organ was insufficient; the consequence was that the open diapasons were receiving a regular *douche*, and the water was running out of the lips of the pipes! I pointed this out to the sexton who was showing me over the church, and he said, "Well, sir, our organist *do* complain. A few Sundays back the water came down on his head during morning service; but what can be done? Our parson has spent a deal of money over that roof!" I suggested that at any rate the organ ought to be removed. Lastly, an organ must be placed in such a position that it is, if not an ornament to the building, at least no disfigurement to it.

Now, there are not many positions which a large organ can occupy in a church so as to fulfil all these conditions, and it is not surprising that it should have created a new feature in church architecture, — the organ-chamber, — which seems to be popular amongst Anglican clergy, as it is to be found in very many new churches, and has been added to not a few ancient ones, sometimes, I am bound to say, not to their improvement. It is, in fact, greatly to be doubted whether it is always advisable to remove an organ from the western gallery where it has formerly stood, to place it in a kind of black-hole at the side of the chancel. This is often done under the idea that the position is more in accordance with ancient usage; but in point of fact, while there is plenty of Mediæval authority for the western choir and organ gallery, there is none that I know of for an organ-chamber, which is an essentially modern feature in church architecture. Ancient organs in western galleries occur at Amiens Cathedral, the Cathedral of Constance, St. Mary's, Lübeck, St. Anne's, Augsburg, and St. Ulrich's, Augsburg; and although the organs have disappeared or have been rebuilt, ancient western organ-lofts are to be seen at St. Stephen's, Vienna, Ulm, Liège, St. Mary's, Würzburg, Ochsenfürth, the Carmelite Church at Boppard, St. Pantaleon at Cologne, &c. The last-named example, however, is so singular in its arrangement that it may have been removed from some other position.

The reason for placing the organ in an organ-chamber is that it may be near the choir, who are now usually placed in the chancel. Whether a choir of laymen was, in the Middle Ages, commonly placed in the chancel seems doubtful. That the chancel was nothing like so universal a position for the singers as is generally supposed seems proved by the arrangement of many ancient churches; for instance, in the old Abbey Church of Cornelimünster, near Aix-la-Chapelle, the choir, with its stalls and complete ritual arrangement is to be seen in the western gallery. The same is the case in one of the earlier of the abbey churches, that of Seligenthal, near Landshüt, where the front of the choir gallery is adorned with a series of beautiful old pictures, and the interior fitted with regular choir-stalls. The same arrangement is to be noticed at the Abbey of St. Maximin at Trèves, though unfortunately here the whole of this interesting portion of the church is much modernised. At the minster church at Roermond, the arrangement of the choir was very singular; it was divided into two parts, each of which occupied one of the triforia of the nave. Each triforium choir terminated to the east in a small apse, bracketed out into the transept, containing an altar, both of which still exist. The original high altar also exists, not in the great apse, but in a smaller apse projecting from its eastern extremity. Mr. Cuypers, who has very carefully restored this church, believes the position to be original. There is a rather later western organ-gallery, but the whole is thirteenth-century work. The curious church called the Alte Pfarrkirche, at Ratisbon, contains a singularly small chancel, only about 10 ft. square, but has a very deep choir gallery at the west end. The stalls have been removed, but the marks of where they were fixed can still be traced; the date is thirteenth century. At Coburg, there was evidently a western choir in a gallery, with a little apse built out over the principal doorway; the arrangement is very picturesque externally. At Limburg-on-the-Lahn, the great triforium, which is vaulted and furnished with several altars, is called the "männerchor"; whether it really served the purposes of a choir is a question which it is not possible to settle, but the name would seem to suggest it.

Notwithstanding the fury which has of late years been exercised against western organs and choir galleries, there is much to be said in their favour, and it would perhaps be well to hesitate before removing them, especially in old churches. The west end of a church is an excellent situation for a large organ, both musically and as regards its appearance. The splendid examples at Lübeck and Bois-le-Duc, and St. Anne's, Augsburg, serve to show what a fine feature can be made of an organ in this position. Musically speaking, also, the western gallery is a good position for a choir, and the arrangement lends itself very well to congregational singing. Much good carving and excellent work has been destroyed by the wholesale removal of west-end organ-galleries. I cannot help also regretting the destruction of the numerous fine Renaissance organ-cases which have disappeared, together with the western organ-galleries.

The organs in cathedral churches, in England at any rate, were generally placed upon the chancel or rood-screen, and it is impossible to suggest a better situation for the instrument, as every single favourable condition is here complied with. The organ has plenty of space about it, and it is consequently sure to sound well. It is away from any walls which could convey its sound out of the building; it is excellent for choir work, and also for congregational purposes; it is more safe from damp and draughts than in any other part of the building, and less liable to variations of temperature. The position has also the sanction of antiquity, as it is recorded that there were organs upon the rood-screens of Durham, Peterborough, York, and Winchester cathedrals, long before the Reformation. In Continental churches a few organs still exist in this position. The Cathedral of Bruges, and that of St. Gomarre at Lierre, are cases in point, though, singularly, in the latter church the organ is sunk into the screen in such a way as to be invisible from the nave of the church. The removal of organs from choir-screens has been greatly in favour of late years, but I trust to live to see them all replaced in their former position. It seems that King Charles I. inaugurated this movement by ordering the removal of the organ in York Minster because it prevented the great east window being seen from the nave. It was, however, subsequently replaced.

When the organ is placed upon the choir-screen, one of two things seem to suggest themselves: either the congregation should be excluded from the choir, or the singers should be placed in the organ-gallery. The present plan of mixing up the congregation and singers in the choir-stalls of the English cathedrals has many great objections. In the first place, it is not edifying to look down the throat of a man just opposite who is singing a solo, nor is it advisable to recognise too distinctly any individual singer in a church. One may have heard him sing music of a very different character, under very different circumstances, which it is undesirable to associate with his present performance, and yet the mind cannot help making this association, to the entire destruction of all solemn thoughts and religious feelings. It is also a great advantage to every choir to have a conductor, and not to trust too implicitly to the organist. Where music in the style of Palestrina is sung unaccompanied, a conductor becomes absolutely necessary. Now a conductor is strangely out of place in the middle of a congregation.

The destruction of choir-screens, both here and on the Continent, is to be regretted. Not only are these screens great ornaments to churches, but they are of considerable use for musical purposes. The magnificent rood-screens at Münster and Bois-le-Duc were, when I first recollect them, used positively as choir-screens, and the effect was remarkably fine. Both have now, unfortunately, been removed. I am told that the screens at Tournay and Bruges are threatened with the same fate, chiefly because they are not Gothic! Some years back the choir of Norwich Cathedral sang from the screen, and I fancy there must be ancient authority for this usage. In France the rood-screen is called "*jubé*," and I cannot help associating this name with the first word of the Complin service,—"*Jube domne benedicere.*" Possibly the Complin service may have been sung from the rood-loft, and hence the name "*jubé*," as given to this feature of church architecture. In Germany the rood-screen is called by a different term in almost every church. At Münster it was called "Apostelngang,"—I fancy, from the statues of the Apostles which adorned it. At Halberstadt it is called "Bishofstuhl" or "ambon"; whether it really served as a bishop's throne or no it is impossible to say. At Hildesheim it is called "Letner," a word closely akin to our word *lectern*,—probably because the Gospel was read from it. It should be noted that, although the rood-screen has generally been destroyed in France, yet the Gospel is always read from the place where it formerly stood. In some old descriptions of churches I have found the words "*pulpitum*," "*paradisus*," used to signify the rood-screen.

Another position for the choir is to the rear of the altar. It is certainly the most ancient of all positions, as may be seen by the arrangement of the basilican churches. It is an excellent position from every point of view, and remarkably convenient, especially in apsidal churches. The great difficulty, however, is the organ. In French churches, where this arrangement is not uncommon, there are generally two organs, —one a small instrument for the choir, and the other placed in the nave of the church for voluntaries and congregational purposes. The disadvantage of this is, of course, its expense, as it necessitates two organs and two organists. I am aware that there is an invention by means of which the same organist can play both organs at once by the application of electricity. It would be very desirable that this invention should succeed, but owing to the expense, or some mechanical difficulties, it has not met with the success which one could wish. I trust, however, that it will not be lost sight of, for, if it could be made thoroughly practicable it would solve many difficulties, and it may turn out to be of the greatest possible value, both from an architectural and musical point of view.

The choir of Ratisbon Cathedral, which is justly celebrated all over Europe for its efficiency, consists of two separate bodies of voices, one composed of clergy, theological students, &c., who are placed in the stalls in front of the altar, and sing the plain chant; and the other of professional singers, who sing the harmonised music, and are stationed in the apse, behind the high altar. The organ is immediately behind the reredos; it is a small but singularly good instrument, so far as it goes. Above the stalls, on either side of the choir, are stone galleries bracketed out, which are reserved for the use of the clergy of distinction who are unconnected with the cathedral; this seems to me to be a very excellent idea,—one which might well be adopted in other places,—because it obviates a difficulty. Strangers ought never to be admitted into the stalls of a cathedral under any condition whatever; yet it is desirable to have some place for foreign ecclesiastics visiting the church. While I was at Ratisbon I noticed that one of these galleries was occupied by an Armenian bishop and his attendants. I must here call attention to a somewhat remarkable but very successful experiment which was made at this cathedral some years back. The plan of the cathedral is remarkably symmetrical, and when it was restored, numerous positions for the professional choir and the organ were suggested. Both were removed from place to place to discover where they would be most effective. The organ, which is, as I have said, a small instrument, was found to be totally insufficient everywhere, except when placed in the apse, where, owing to some extraordinary acoustic properties of the building, it has the effect of a large and powerful instrument. It was also discovered that the same effect was produced by the choir, so that a body of some twenty voices was found to produce the effect of a very large choir; it was, however, found necessary to play and sing the music very much slower than it would be ordinarily taken; a false note or a breakdown would, of course, be multiplied fourfold, and what would be the result of a cypher on the organ I tremble to think. Such things, however, do not happen with the Ratisbon choir, and I do not think that anything

could surpass the superb unaccompanied music of Palestrina as rendered by this choir and in this cathedral; it seems to wind round and about the lofty columns and in and out of the stately arches in a way that baffles all description. I went to the church over and over again before I could discover where these grand waves of harmony proceeded from. This is the only case I know of in which the choir and organ have been placed and arranged with a view exclusively to the acoustic properties of the building, and yet one would naturally have expected to find such a proceeding rather the rule than the exception. The arrangement of organ and choir behind the high altar is not uncommon in France, and wherever I have heard it, the musical effect is remarkably good.

In cruciform churches one of the transepts is an admirable position for the organ. A very fine and effective instrument has been erected in the south transept of Worcester Cathedral.

The aisles of a church are not a good situation for organs without they are like those in the German churches,—remarkably lofty. Ancient organs in this position are to be found at St. Afra, Augsburg; at St. Stephen's, Vienna; at Nordlingen, in Suabia; at Ingolstadt, in Bavaria; and at the Cathedral of Erfurth. The organ-lofts in each of these cases are very charmingly-designed; all these churches, however, possess an organ at the west end in addition to that situated in the aisles. There is a gallery at the west end of the north aisle of Winchester Cathedral which was probably formerly an organ-loft, though we know that the principal organ of that church stood on the rood-loft. Another very favourable ancient position for the organ was in a gallery bracketed out from the triforium of the nave. The ancient organs at Chartres, Freiburg, and Strasburg are in this position, and in all probability the so-called minstrels' gallery at Exeter was nothing more than an organ-loft. We know also that, in addition to four organs in different parts of the church, Durham Cathedral had an organ corbelled out from the triforium of the nave. Although it is a fairly-good position for a moderate-sized organ, yet it has several drawbacks; the organ is generally too high up to be quite satisfactory, either for accompaniment or as a solo instrument. Undoubtedly an organ sounds better when raised above the level of the heads of the congregation, but some of its tones must be lost when it is raised some 50 ft. or 60 ft. above the pavement.

Old organs were very frequently placed over the choir-stalls. That of the old Cathedral of St. Paul was in this situation, and the Cathedral of Milan and many Spanish and Italian churches are examples in point. Unless, however, the choir projects west of the transepts, so that the organ can stand under one of the arches of the crossing, there is scarcely sufficient space for a modern organ of large dimensions, and it has led to the very objectionable practice of cutting the organ in half, and placing one half on one side of the choir and the other half on the opposite side, the two being connected by trackers underneath the floor. It is useful, however, sometimes, to have a small organ over the stalls when there is a large organ in another part of the church. This is the case at Worcester Cathedral.

We sometimes, though very rarely, find old organs placed on the ground to the east of the stalls, and it is to be remarked that the only pre-Reformation organ-case existing in England, that of New Radnor Church, is in this position. Occasionally the organ is placed on a gallery at the back of the altar. Handel's organ at Whitechurch is in this situation; both organ-case and choir-gallery were designed by Wren. In some of the Lutheran churches in Germany the organ is over the altar. It is so at St. Anne's, Augsburg, but there the altar is the intruder, as the fine old organ holds its original position at the west end of the church, and a modern altar is placed under it. I think it was at Ludwigsburg I saw a singular three-decker arrangement,—not pulpit, reading-desk, and clerk's desk, as one sometimes sees in England,—but an altar below, a pulpit immediately above the altar, and an organ above the pulpit.

It is now customary to place the organ in a chamber at the side of the chancel. I find that this arrangement is almost universally condemned by musicians, and especially by organists. A correspondence upon the subject has recently taken place in the *Musical Standard*, and the veto was strongly against these structures. A very eminent organist lately told me that it was about as bad a position as could possibly be found for an organ, and for his part he would as soon see the organ placed out on the opposite side of the street. I will here relate the objections to organ-chambers which I have heard advanced. (I am not now giving you my own opinion, but that of those who are far more able to judge of the matter.) It is advanced that an organ, like all other musical instruments, requires to be placed in an open and isolated position, and that it should never be inclosed or surrounded, except by its own case. We know that when a good pianist wants his instrument to sound well, he draws it away from the wall, and opens the top, so that there shall be nothing to intervene between the instrument and his audience. And it is even more important that an organ should be unencumbered by surrounding objects than a piano, because the organ consists of at least two parts or subdivisions, the most important of which is called "the great organ," and the less important "the swell organ." Now the characteristics of "the great organ" should be power, grandeur, and distinctness of tone, and the "swell" should be more subdued, sweet, and gentle, with a contrivance for producing variety as to *piano* and *forte*. The contrast between the various portions of an organ form one of its greatest merits as an instrument, and these contrasts are effected by certain mechanical means. The "great organ," for instance, demands a clear space to give forth its majestic tone, the "swell" requires to be inclosed, but to be able, when wanted, to break away from this inclosure and give forth a fine *crescendo*. This is effected by a contrivance somewhat resembling Venetian blinds. If there is a choir-organ it should be clear, delicate, and very sweet in tone. Now, when the whole thing is shut up in a box,—and an organ-chamber is really little else,—much of this wonderful contrast is gone, because the very conditions demanded by the instrument are unfulfilled. But some people may say, "Oh, I like the subdued tone of the organ, and cannot bear to hear it when it is loud." An unfortunate organist wrote to the *Musical Standard* a few days back that he was absolutely forbidden by the clergyman to play anything but soft voluntaries on the instrument, and was ordered not to play Bach's fugues because the same clerical authority considered them "undevotional"! Now to such people as this what I should say is, "Why on earth go to the expense of a powerful organ, when, for 8*l*., you can get a harmonium which will be better suited to your taste, or want of taste?" It is surely folly to pay for grandeur of tone and power, and then shut them up in a box where they cannot be heard. Yet this is very frequently done. I have often heard really good organs, crammed into organ-chambers, which have, from their unfortunate position, had little more effect than a harmonium. Sometimes, to make matters worse, the organ-chamber will be enclosed by low arches and screens of wood or stone, — all forming a carefully-constructed sound-trap or gag. The fact is that when the organ is placed in an organ-chamber, the great organ" is reduced to becoming a "swell organ," without the power of producing *diminuendo*, or *crescendo*. As a rule, also, organ-chambers are far too small to hold an efficient instrument, and the various parts have to be crowded together, and this is always bad. Mr. E. Turpin, the eminent organist, writing in the *Musical Standard*, gives 20 ft. by 20 ft. by 20 ft. as the smallest sounding-space for a church organ; yet how few organ-chambers are of these dimensions. Another defect in organ-chambers is the fact that they are nearly always damp. Now, damp is sure ruin to an organ. Then, also, an organ is difficult to get at when blocked up in a chamber. It is most important that every part of an organ should be easy of access, otherwise it may be absolutely necessary to take down nearly the whole of an organ to remedy some trivial defect which an organist himself could easily rectify if he could obtain access to that part of the instrument where the defect lies. The great organ at Bois-le-Duc is admirably arranged in this respect, being furnished with a staircase and galleries inside.

From an artistic point of view much has been lost by the organ-chamber, which is nearly always an ugly adjunct to a church. Directly organs are relegated to the chamber they no longer come under the attention of the architect, and that singularly-beautiful article of church furniture, the organ-case, is abandoned. But as long as the organ occupies an important position in the building, the case must be carefully designed; and when one sees how magnificently the Mediæval and Renaissance men treated that architectural feature, one cannot help wondering why it so rarely receives any attention at the present time. There are, I am glad to say, some few exceptions, and fine cases have been erected at Worcester, Hoare Cross, and Manchester, and have been designed for St. Margaret's, Westminster, and St. Martin's, Brighton. It is, however, very strange that, as a rule, the only portion of an organ which it is attempted to decorate are the pipes. This is certainly a work of supererogation, because the pipes of an organ are sufficiently handsome in their natural condition; whereas the deal-posts and match-boarding, which generally do duty for a case, would certainly be none the worse for what our Yankee cousins call "a lick of paint." If people are very rich and anxious to spend money upon an organ, they should have the pipes embossed. One paints iron to prevent rust, but it seems repugnant to one's feeling to paint tin. I do not, however, propose to detain you by remarks upon the artistic treatment of organ-cases, because this subject is dealt with in a very complete manner by Mr. A. G. Hill, who, in his work upon the organ,—about to be published,—has illustrated and described all the most important examples at present existing in Germany, Holland, Belgium, France, England, and some few even in Italy and Spain. Most of these are reproduced from Mr. Hill's own sketches. By rare good luck Mr. Hill has also become possessed of many curious engravings of old organ-cases now destroyed. To the artistic value of the work he has been able to add much practical information gathered from personal experience as a partner in the well-known firm of Hill & Sons,—which is, I believe, the oldest firm of organ-builders in England.

I now come to the question, "What is the best position for an organ in a church?" And in consulting several eminent organists, I have nearly always received the following reply to the question:—"Either some central position as much isolated as possible, or a western gallery." Now, the objection to a western gallery is, that although it is admirable for sound, people, and especially the Anglican clergy, are opposed to having the choir so far removed from the altar. But I venture to think that the central position might be managed. It certainly suggests a choir-screen of some kind or other; and why should not the choir-screen be constructed in the form of a solid arch or bridge crossing the eastern bay of the nave? This need not occupy any space upon the ground-floor of the church, because the nave benches might be continued under it to its eastern extremity, or the choir might be carried on to its western extremity. If the first plan were adopted the organist would sit in the gallery above the arch; but if the latter were carried out he would play from the west end of the choir-stalls, under the arch. I have ventured to show how this arrangement might be carried out.* It may be objected that this scheme gives very great prominence to the organ, but I would ask, Why should not an organ occupy a very prominent position in a church? It generally costs more than all the rest of the church furniture put together. It is, as I have shown, becoming every day a more and more important adjunct to divine worship. It is capable of the highest artistic treatment and architectural development. Why, then, should it not be brought boldly forward and placed in a situation worthy of the king of instruments? In the Middle Ages the organ was regarded with the most extraordinary reverence, and we find St. Peter Damian, in his exquisite hymn "De Gloria Paradisi," enumerates the tones of the organ amongst the joys of heaven. Now, it so thoroughly describes what an earthly choir ought to be that I venture to quote it:—

"Novas semper harmonias,
Vox melodia concrepat;
Et in jubilum prolata
Mulcent aures organa."

("Lovely voices make a concert,
Ever new and ever clear;
And in never-ending festal
Organs soothe the ravish'd ear.")

[The discussion which followed the reading of this paper is reported on p. 193 of this number of the *Builder*.]

* Mr. Brewer's drawing embodying this suggestion is reproduced as one of our illustrations.

THE EDEN THEATRE, PARIS.

THE new Eden Theatre consists of a vast pile erected in the Hindoo style, very freely treated, on the same lines, and by the same architect, as the Eden Theatre at Brussels, covering altogether more than an acre of ground. It occupies the site of the town house of M. Henri Schneider of Creuzot, for some time President of the Chamber of Deputies under Napoleon III.; and its principal façade, containing the public entrances, faces on to the Rue Auber, within sight of the new Opera House. So central a position was necessarily expensive, and it is stated that the land alone cost 240,000*l.*, while, as the buildings cost a further sum of 160,000*l.*, the gross outlay amounted to the enormous sum of 400,000*l.* Not a little of the expense was due to the contractor's difficulty in finding a sufficient foundation. When the ground was excavated he came across that underground stream known as the "Grange-Batelière," which haunts this part of Paris, and which had already caused great expense and trouble during the construction of the Opera House and other buildings in the neighbourhood.

The theatre is erected solely for the exhibition of the ballet and spectacular effects on a grand scale, and for providing extensive lounge and promenading-room for those to whom such amusement is sufficient. In plan and general arrangements it is most unlike other theatres, and consists only of two tiers. On the ground-floor is a spacious entrance-hall, extending the full width of the main front, having at each end broad staircases giving access to the upper floor, and with doors opposite the entrances leading directly into the *parterre*. This entrance-hall has its roof supported by two rows of massive stone columns, of a grotesque shape, giving the effect of the pillared halls of the Southern Hindoo style. The whole of the *parterre* is devoted to the *fauteuils d'orchestre*, and is surrounded by small boxes, to which access is gained from the broad enclosing corridors. On each side of the house and under the *foyers* of the upper floor are extensive retiring and cloak rooms, pillared like the entrance-hall.

Passing from the front up the staircases, built of light brown Pyrenean marble, each of which cost 3,000*l.*, we find ourselves in the great central *foyer* in a blaze of light and gorgeousness which perhaps has never before been realised. This *foyer* is about 100 ft. by 50 ft., covered with a dome in the centre painted by Clairin, and having at the side a lofty arcade opening into the corridors of the auditorium. The floor of this *foyer*, which, like that of the corridors, is formed of marble mosaic, is raised above the other floors of this tier, and thus enables those who sit at the refreshment-tables or promenade in it to see much of the performance at the same time. The auditorium, which is an imperfect octagon, the side of the proscenium being the largest, is surmounted by a flat circular dome, also painted by Clairin, with grotesque figures of acrobats and dancers, which, though clever and brilliant in itself, is incongruous, and forms the only drawback to the archæological completeness of the building. From the centre of the dome depends a huge and fantastic gas-chandelier, weighing some seven tons, made up of stained glass and brightly-painted reflectors and hangings. The dome is carried from the angles of the octagon by colossal caryatides, chocolate-tinted and nearly nude, supported by corbels formed of elephants' heads. Each side of the octagon, except the proscenium side, is pierced by an arcade of three arches standing on massive bulbous-shaped columns, and cusped and inclosed in square labels, and surmounted by a bold cornice corbelled well out and running continuously round the hall. The arcade stands upon a lofty plinth, which forms the inclosure of the corridors, and thus shows the whole of its beautiful and striking proportions, giving an appearance of strength and vastness to the auditorium impossible where the principal architectural features are hidden away among seats and people, and covered up by hangings and box fronts. Around the octagon on three sides runs a broad corridor, arcaded on each side to correspond with the arches of the house, which, with the space left by the angles of the octagon, affords ample room for those who only desire to promenade. On each side of this corridor are two *foyers* about the same size as the front one. That on the prompt side, known as the Indian Court, is decorated to match the rest of the house, and has the similar arcades repeated round it, but it is lighted by the arc electric lights; whilst that on the other side is provided with a glass roof, and, being fitted up with fountains, rockeries, and choice exotics, forms the veritable garden. The sides of these two *foyers* facing each other are covered with enormous sheets of looking-glass, with the result that the view from one to the other across the auditorium produces the appearance of a building of illimitable extent and of innumerable columns, rivalling the vision of Vathek in the hall of Eblis. The variations also in the colouring produced by gas and the electricity are curious, as the alternating spaces appear to be either brilliant with artificial light or bathed in the softest moonlight. The whole of the interior of the building, save only the entrance-hall, glows with the richest colouring. Except in the figured ceilings by Clairin, the colours employed are mainly primitives, the columns and arcades being nearly all painted a brick-dust red, fluted and picked out with gold. The deepest tones are supplied by the huge chocolate caryatides and the black elephant heads, while the masses of exotic foliage scattered through the *foyers*, and the brilliant tinted costumes of the attendants and the visitors, make up altogether a rich and ever-changing harmony of colouring rarely equalled.

The theatre being built solely for *spectacle* makes the question of its acoustic properties of comparatively small value, but should the management ever wish to devote it to the purposes of a lyric theatre, it is likely that it would prove a failure. As it is, the music of the band, which is a large and loud one, is frequently blurred by the echoes with which the dome appears to be alive; and a voice would be drowned by the continuous hum which reverberates through the *foyers* and surrounding corridors.

In the matter of its exits and staircases this, the last large theatre built, would scarcely satisfy the requirements of our London authorities. The Préfecture of the Police of Paris have calculated that the house will allow of over four thousand people to enter and circulate with ease at one time; but the bulk of these people would be on the upper floor, where only the lounging-room is found, while to reach or leave this only two staircases are provided, each of which, for more than half its length, consists only of a single flight. Moreover, these flights face each other, and all the people leaving either from above or below are brought into the centre of the entrance-hall to go out by a few comparatively narrow exits fitted with doors that open inwards. The exit from the stage is still worse. Where there are at times as many as seven hundred people employed at once behind the curtain, besides horses and other animals who have their stables in a basement, it seems incredible that the only way out provided for the stage is into a small courtyard, which is common to other houses, and through a narrow archway into a by-street, — the Rue Caumartin. Although in the principal façade, towards the Rue Auber, the details employed within the building are used as correctly, the result is less pleasing and less successful. By daylight the towers at each end of the front look picturesque, though altogether it looks small and bizarre; but at night, when all is lighted up, the deeply-coloured stained glass with which all the windows are filled conveys some idea of, and well advertises, the gorgeousness to be found within.

Remembering the large sums which have been spent on the building and its site, and the enormous expenditure required to keep it open, one may well ask,—Will it pay? But looking at it only as an architectural effort, we cannot but regard it as one of the boldest as well as one of the most successful attempts of our time to revive and adapt one of the richest, but one of the most obsolete, of the ancient styles.*

J. TAVENOR PERRY.

Stained Glass: Lympne Church, Kent.—Two stained-glass windows, one representing St. Stephen addressing the Council, the other his Martyrdom, have just been erected in the chancel of the above ancient church, of which St. Stephen is the name Saint. They flank a central Crucifixion east window, all being from the studio of the same artists, viz., Messrs. Powell Bros., of Leeds. The glass and designs are after the thirteenth-century style.

* We will give some sketches of the building in our next.

BUILDINGS FOR TECHNICAL EDUCATION.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

AT the ordinary general meeting of this Institute, held on Monday evening last, Mr. E. I'Anson, vice-president, occupied the chair.

The Royal Gold Medal, 1883.—It was announced that the Council, after careful consideration, had resolved, subject to the approval of the general body of members, to recommend to her Majesty the name of Mr. Francis Cranmer Penrose as that of the recipient of this year's Royal Gold Medal. Mr. Penrose was one of the past vice-presidents of the Institute, he was surveyor to the Fabric of St. Paul's Cathedral, and he was the author of "An Investigation of the Principles of Athenian Architecture," being a result of the careful survey of buildings in Athens conducted chiefly with reference to optical refinements. That important work was published so long ago as 1851, and was the result of investigations carried on in Athens some four or five years earlier. It was chiefly on account of the great merits of that work that the Council had resolved to recommend Mr. Penrose as the recipient of the medal.

The Pugin Studentship.—For this studentship there were fourteen competitors. The Council had awarded it to Mr. W. A. Pite, of Bloomsbury-square. The Sharpe prize was awarded to Mr. J. G. Sankey, of Fitzroy-square, who was adjudged to be second in merit. In the same competition a certificate of honour and 5*l.* 5s. were awarded to Mr. H. H. Kemp, of Kilburn-square; and a certificate of honour to Mr. C. A. Bassett-Smith, of Alexander-road, St. John's Wood.

The Godwin Bursary, it was announced, had been awarded by the Council to Mr. Hugh McLachlan, of 45, Fenchurch-street, who had signified his intention of travelling in North Germany. There were four other competitors.

Mr. E. C. Robins's paper (or, rather, an abstract of it) on "The Special Buildings required for Applied Science and Art Instruction, and for the Development of Technical Education generally," was then read by Professor Armstrong, in the absence of Mr. Robins through indisposition. The paper commenced with some general remarks on the rapid growth of interest in scientific research, and in the provisions made all over the civilised world for applied science teaching, the author observing that the study of the natural sciences hitherto relegated to the "modern side" was rapidly being included in the curriculum of every liberal education; that the application of the principles of physical science to the development of mental activity as well as to industrial enterprise would in all probability be the distinguishing peculiarity of the latter half of the nineteenth century. This great revolution in the systematic education of the period, to which attention had been drawn by Professor Huxley and confirmed by Professor Matthew Arnold, pointed to a corresponding change in the design of the buildings required for its development, and thus gave the *raison d'être* for the subject under discussion. Mr. Robins said that his paper, read at the Society of Arts last May, on "English and Foreign Technical Education,"* was an introduction to the present one relating to buildings required for its future development. In that lecture he gave no illustrations of the buildings or their fittings; he now proposed to enter upon the examination of English and foreign examples, and to draw attention to the peculiarities of the arrangements required. The establishment by the present Government of the Royal Commission on Technical Education, and the spirit displayed by the City and Guilds of London and by the public generally, led him to think that the present was an appropriate time for specially introducing the subject to the consideration of the Royal Institute of British Architects, the services of whose members would be required to meet the coming demand for suitable buildings. The author defined technical education as being a knowledge of the practical application of scientific principles to practical objects and purposes, and as being no less necessary to the professional man than to the manufacturer and artisan. Being somewhat of an enthusiast on the subject, he was anxious to enlist the sympathy and co-operation of the members of the Institute in furthering the success of the movement now in progress for the

* See *Builder*, vol. xlii., p. 683.

extension of technical education in this country, and they could do that by giving their consideration to the questions involved in the provision of the best possible,—*i.e.*, the most suitable,—buildings and fittings for the purpose. Some three or four years ago, when occupying the chair as Prime Warden of the Dyers' Company, he induced that company to take part in the promotion of the City and Guilds of London Institute for the Advancement of Technical Education, which was now engaged in the erection of buildings and in other work the ultimate capital expenditure on which would not fall far short of 150,000*l.*, and the maintenance of which would require an annual income of 30,000*l.* or 40,000*l.* As a member of the Executive Committee of the City Guilds' Institute, he had accompanied some well-known professors to Germany to inspect the latest examples of buildings devoted to the teaching of science, and he proposed to give the result of his studies in so far as the limited time and space at the disposal of the Institute would permit. To this end he divided his paper into two general divisions, viz.:—First, the particular accommodation required for some of the leading subjects and the systematic general arrangement of the plan. Secondly, the various fittings and apparatus applicable to the distinct uses of each. No such attempt having as yet been made, he hoped to make the matter clear by fulness of illustration. He proceeded to observe that, of course, all technical education did not require special accommodation; the ordinary class-rooms attached to school-buildings might be appropriated to certain kinds of technical or applied science instruction, provided they were efficiently lighted and ventilated. But there were many subjects which must be taught in specially-designed buildings, for example,—chemistry and physics, biology and physiology, botany and forestry, mechanics and engineering, anatomy, architecture, and the fine arts generally, involving the provision of laboratories, lecture and work rooms, drawing and modelling rooms, &c., separately grouped together in a certain order and contiguity, specially floored, drained, lighted, heated, ventilated, and arranged for particular furniture, fittings, and apparatus, not to speak of the specific trade schools for teaching weaving, dyeing, &c. Mr. Robins referred to the remarkable impetus observable abroad towards the construction of such building, and reviewed the general principles underlying their admirable planning, noting also their defects, and deduced some general rules for the guidance of future designers. He then proceeded to describe several *Foreign Buildings*, illustrations of which were exhibited, namely:—1. Bonn and Berlin Chemical Laboratories; 2. Munich ditto; 3. Aachen ditto; 4. Gräz ditto; 5. Physiological Laboratory at Berlin; 6. Physical and Chemical ditto, Chemnitz; 7. Physical Laboratory at Würzburg; 8. Technical High School, Hanover; 9. Fine Art and Building School, Charlottenburg; 10. The Great University, Strasburg; 11. Technical College, Japan;* 12. Royal Technical High School, Stockholm; 13. Technological School, Gottenburg; 14. Chemical Laboratory, Pest. Of the *English Buildings* described by Mr. Robins were the following:—1. The Central Institution of the City and Guilds of London Technical Institute, South Kensington; 2. The Finsbury Technical College; 3. University College, London; 4. Roscoe's Chemical Laboratories, Owens College, Manchester; 5. The Manchester Grammar School Chemical Laboratories; 6. Josiah Mason Science College, Birmingham;† 7. The Yorkshire Applied Science College, Leeds; 8. The Bristol Trade and Mining School of the Society of Merchant Venturers. In the course of his observations (from which, owing to the great length of the paper, we can only cull a sentence here and there), Mr. Robins remarked that the general principles underlying the design, or, rather, the planning of buildings intended to be used for purposes of technical education, had not, so far as he knew, been formulated, nor had any attempt been made in that direction, no doubt owing to the vastness of the subject. The Chemical Laboratories of Bonn and Berlin were the earliest important buildings of their kind erected on the Continent, but they were failures in some respects. One of the great imperfections of the Berlin Laboratory is that a long series of rooms in which the students perform work requiring great care and delicacy,—as, for instance, in the balance-rooms, where weighing operations of great nicety have to be performed,—are actually made to serve as thoroughfares from one part of the building to the other, there being no corridor. That was obviously a very serious defect in planning. The building was erected in 1863, and very full information concerning it was to be found in the Thirteenth Report of the Science and Art Department. The Bonn Laboratory was defective in similar respects. On the other hand, the new laboratory at Munich might be almost accepted as the model of what a large chemical laboratory should be. With regard to the warming and ventilation of these buildings, at Berlin and Bonn there were no special arrangements for ventilation. The ventilation of the rooms in the laboratory at Munich was effected by means of a fan placed in the base of a shaft into which extraction-flues from all the rooms opened, the air being thus pulled, or sucked, out of the rooms. Air is admitted to the rooms through gratings, being previously warmed in winter by being made to pass over steam-heating chests. With regard to special ventilation, a number of stink-closets are placed in the windows, the object of placing them in these positions being that of getting a good light. Each of these stink-closets had a large stoneware flue leading from it, and carried up in the wall until it reached a large flue built just under the roof, where there was another fan for the purpose of exhausting the air and fumes from the stink-closets. This arrangement, however, proved to be very unsatisfactory in action, for if any of the doors of the stink-closets were open the two fans were engaged in pulling against each other. So great was the inconvenience experienced from this cause that the plan of exhausting the foul air of the room by a fan was abandoned, but the fan for the exhaustion of the stink-closets was retained. At a laboratory in Geneva a similar arrangement of two fans was adopted, but it subsequently had to be modified in the same way as at Munich. Two of the most successful of chemical laboratories on the Continent were those of Aachen and Gräz. The arrangement of the rooms in such buildings necessarily depended not only on the site, but on the special requirement of the locality in which they are situated. The buildings at Aachen and Gräz were instances of successful systems of ventilation. The system adopted at Aachen was this:—There was a central heating-chamber filled with steam coils, and the air was forced through this chamber and delivered through openings into the colonnades and rooms of the building. An ingenious arrangement of thermometers in connexion with electric alarm-bells, gave warning to the man in charge of the heating-apparatus when the required temperature in any given part of the building was being exceeded, and he was able to modify it. There was also a system of hygrometers, which gave warning in a similar way when the air was too dry, to remedy which steam was impelled into the heating-chambers to give the required degree of moisture. At Gräz the system of ventilation and warming was very similar to what was being adopted in the buildings being erected in London by the City and Guilds of London Institute. By means of a large fan, air was drawn into the buildings and forced into the various rooms; but at Gräz, as the buildings were somewhat extended, instead of having a central heating-chamber, heating-chests were placed in several positions about the building, and the air was forced through them before being delivered into the various rooms, extraction-openings being provided by means of flues which are built in the walls. Passing on to notice the arrangements which had been adopted in the Finsbury Technical College, Cowper-street, City-road, Mr. Robins pointed out that the system of planning adopted by the architect (Mr. E. N. Clifton) was a very simple one, involving no great distances from one part of the building to another, and, therefore, Messrs. Bacon, who had carried out the heating arrangements of the college, had followed a plan very similar in its main details to that at Aachen, the air being forced by a fan through a heating-chamber, and thence through flues into all the rooms, corresponding outlets being provided for the purposes of extraction. In the Central College of the Institute, now being erected from the plans of Mr. Waterhouse, A.R.A., at South Kensington, a somewhat different system was being adopted, although somewhat similar to that adopted at Gräz, the air being forced by means of a fan through heating-boxes placed at the base of the corridor wall, whence the air passed up through flues into the various rooms, finding its way out through corresponding openings, placed, in most cases, opposite to the inlets. At Owens College, Manchester,* a large shaft was made use of for exhausting the air from the rooms. In the author's building at Bristol,—the Merchant Venturers' School,†—the ventilation was effected by means of a fan, and heating-boxes were provided, but there, instead of the air being forced into the building by the fan, air was admitted through openings near the windows and passed over heating-boxes in winter time, the fan being employed for exhaust purposes, and sucking the air out of the rooms through openings in the floors. In the plans of the Cowper-street building it would be seen that in addition to the ventilation-chamber there was a large shaft. That shaft, however, had nothing whatever to do with the general ventilation of the building, but, in addition to carrying off the flue gases from the boiler furnaces, it was used to effect the ventilation of the chemical laboratory, into which the warm or cold air (as the case might be, according to the season) was forced through openings along the wall. There was an elaborate system of extraction-flues extending under the whole of the floor, and these flues were in communication with a series of downcast shafts projecting just above the surfaces of the working benches, and placed 4 ft. apart. Over the benches was a continuous hood of such a form as to prevent chemical effluvia from passing up beyond the influence of the down-cast extraction-shafts, which were ultimately led into the shaft before mentioned. There was thus, on the one hand, a "push" of air into the laboratory, by means of the fan, and a "pull" of air out of it by means of the shaft before mentioned. Proceeding to sum up the conclusions of the paper, the author observed that while there was a great similarity in the German laboratories after Bonn and Berlin,—the only differences being in minor details,—in this country, on the other hand, we had departed to a considerable extent from the arrangements which were in vogue in Continental countries twenty or thirty years ago, and were acquiring, in fact, a style of our own in the planning of such buildings. In Continental laboratories elaborate means were taken to keep the students of different classes apart, but in none of the English laboratories was it so. In Owens College, Manchester, the chemical laboratory, which might be regarded as the first English laboratory of any importance, — and in the planning of which Mr. Waterhouse acted upon suggestions made by Professor Roscoe, — might be regarded as simply two rooms, side by side, separated by glazed walls and with windows and glazed closets between them, the junior students being on one side of the partition, and the senior students on the other. It should be remembered, however, that the comparative simplicity of arrangement which was suited to an English chemical laboratory was due to the fact that in England it was difficult to get a student of chemistry to devote more than a year to the subject, while in Germany the students stayed for periods of five, six, and seven years, and therefore needed more complete accommodation. The laboratory at the Cowper-street College was practically divided into two, so that the arrangement was virtually the same as at Owens College. A somewhat similar arrangement was also adopted for Mr. Waterhouse's laboratory at the Leeds College, and also at the Central Institute. In conclusion, reference was made to a number of other buildings, many of which were illustrated by the drawings (upwards of 100 in number) hung on the walls of the meeting-room.

The Chairman, in inviting discussion, said that the paper was so full of details that it was very difficult to know where to begin the discussion, but every one would admit the importance of the subject with which it dealt. Perhaps Sir Frederick Bramwell could favour the meeting with a few remarks.

Sir F. Bramwell said, with regard to the question of ventilation, that the great problem was to get sufficient fresh air into a building without inconveniencing the people who were

* For plans, sections, and description of this building see *Builder*, vol. xxxviii., pp. 449, 476, 477, 484.

† Illustrated and described in the *Builder*, vol. xxxix., pp. 439, 444, 446.

* Illustrated in *Builder*, vol. xxix. (1871), view and plan, pp. 86, 87.

† Illustrated in *Builder*, vol. xlii., pp. 518, 520.

in it. By mechanical means it was no doubt possible to get in a sufficiency of air, but if it were got in without any special provision being made for its reception, the people near the inlets would suffer great inconvenience, and more especially would this be the case in summer time, when the air that would be sent in would be cooler than that in the room. He knew that if air impinged on a person at the rate of more than 1½ ft. per second, or, in round numbers, a mile an hour, the person could not but feel uncomfortable. In order to keep down the velocity of the flow of sufficient air into a room in which many people were assembled it was necessary to spread the orifices over such an extent of space as to virtually necessitate the provision of double walls. One of the buildings which Mr. Phipson had ventilated was the meeting-room of the Institution of Civil Engineers, and there the result was thoroughly satisfactory. The air was forced in at the rate of 1,000 cubic feet per hour for each person present, but the velocity was not so great as to make any one in the least degree uncomfortable. In order to obtain that result, however, the size of the room had been sacrificed to a very considerable extent,—probably to the extent of 1 ft. 6 in. all round the room, making a great difference in the area. If people were prepared to encounter similar expense and deprivation of area they could get perfect ventilation, but it could not be obtained otherwise, so far as he knew. Where the inlets for fresh air were limited in number, as they almost always were, the persons in the vicinity of them would stop them up if they experienced discomfort from them, and that had been done in the hall of the Society of Arts, where the chairman had exerted his authority by having the openings behind his chair covered over with brown paper. People said, "It may be very healthy that we should have fresh air, but it is very unhealthy to have rheumatism." The great problem in ventilating all buildings was how to get enough air into a room without anybody knowing it.

The Chairman asked what provision had been made for the air to get out of the hall of the Institution of Civil Engineers.

Sir F. Bramwell said it got out as Providence pleased. Many architects, he was sorry to say, simply made holes in a ceiling to let the air out, but they made no provision for inlets: consequently when the door was opened those in its vicinity suffered very great inconvenience. If the air was sent into a room by a fan, under pressure, and so creating a *plenum*, it was a work of supererogation to put any exhaust openings. On the other hand, if the air were introduced into a room by means of suction, Heaven help those who were near the doors and windows!

Dr. C. W. Siemens observed that the numerous plans which Mr. Robins had succeeded in getting together were most instructive, as showing what had been done and was being done in the provision of buildings for technical education, and especially as marking the progress which had been made in the arrangement of chemical laboratories. In some of the plans of polytechnic schools abroad, the arrangements were perhaps a little too elaborate. He thoroughly approved and appreciated the plan which had been followed in English laboratories of not too rigidly separating one class of students from another, and he quite agreed with the author in his definition of technical education as the teaching of the science underlying an art or manufacture. That view was now becoming more and more adopted, but some of the earlier polytechnic schools abroad had erred on the side of attempting to turn out students completely instructed in a trade. With regard to the warming of buildings, he was old-fashioned enough to wish to see some radiant heat introduced into the buildings which had been described, for he believed no room could be thoroughly healthy without radiant heat.

Mr. Philip Magnus, in the course of a long speech, pointed out the differences between the polytechnic schools and the numerous schools for industrial education which existed on the Continent, and observed that within the last twenty years a very great change had taken place in systems of education for industrial purposes. Mr. Robins's paper, as read, had said nothing about the requirements necessary in buildings for the teaching of physics, mechanical science, and other sciences, — requirements which were very different from those needed in chemical laboratories, although all these requirements had, of course, to be met, and would, it was to be hoped, be satisfactorily met, in the new building now being erected at Kensington for the City and Guilds of London Institute, in which building, by the bye, Dr. Siemens's desire for radiant heat would be gratified, for there was to be an open fireplace in every room.

Mr. Charles Barry, in moving a vote of thanks to Mr. Robins, coupled with an expression of regret at his absence through illness, said the paper was not only interesting and valuable in itself, but it had been the means of eliciting valuable information from some of their distinguished visitors. Mr. Robins's paper was one more step taken in the direction in which almost every educated man's thoughts in this country were travelling now, viz., how best to improve and beautify the manufactures of this country, not by making the manufacturers and workmen mere machines, but by enabling them first to know the principles and then to apply them in practice. The movement in furtherance of improvement in this respect had now taken firm root in this country, and Mr. Robins's paper was timely as leading architects to give due consideration to the class of buildings which would be required all over the country if the movement spread. He quite agreed with Dr. Siemens that there was a danger of overdoing it, and of providing buildings which were too elaborate; what they should seek to arrive at was, What was the minimum of elaboration that was necessary? With much simpler appliances than were now procurable it should be remembered that England had produced Faraday,—not but what he believed that Faraday, had he been living now, would have heartily supported the movement which was now in progress for the spread of technical education.

Professor Perry, in seconding the vote of thanks, said that Mr. Robins's paper, when it came to be published *in extenso*, would be found to be very valuable, and much more complete than would seem from the fragments which had been read that evening. Mr. Robins had given very great attention to the subject, and his paper would be found to deal with buildings suited not only to the chemist, but to the physicist, the mechanical engineer, and to the professors of other sciences. Reference had been made to the complicated nature of some of the buildings of which plans were exhibited, but that complication was more apparent than real, arising as it did out of the largeness of some of the buildings which they illustrated.

Mr. C. F. Hayward, in supporting the motion, gave a few details of the chemical laboratories and science schools which he erected at Harrow School a few years ago, in reference to which he was indebted to some advice very kindly given to him by Professor Tyndall. As an example of the simpler kind of buildings which had been desiderated by Dr. Siemens and Mr. Barry, they might be useful for purposes of comparison, and he should be glad to exhibit his plans on any future occasion when the subject might be revived, as no doubt it would be.*

The Chairman was about to put the vote of thanks, when Professor Roger Smith moved, and Mr. Rickman seconded, the adjournment of the discussion. It appearing, however, difficult to find another night for the subject during the present session, the motion was withdrawn, and the vote of thanks having been passed to Mr. Robins and to Professor Armstrong for reading the paper, the meeting was brought to a close.

Steam Mills, near Cinderford. — New schools erected here for the Forest of Dean United District School Board have been opened. They have been designed by Mr. Alfred Smith, architect, Mitcheldean, to accommodate 417 children,—boys, girls, and infants. They are Gothic in style, the walls being constructed with grey Forest of Dean rubble stone with wrought dressings. The buildings are heated throughout with hot water, this work having been done by Mr. Leary, of Parkrow, Bristol. The contractors were Messrs. Coleman Bros., of Chathill, near Gloucester. The cost of the buildings has been 2,865*l*. Mr. Wm. Jones has been the clerk of works.

* Among other buildings of the kind, we may mention two which have been illustrated in the *Builder*, viz.: The Clarendon Laboratory, Oxford, Mr. T. N. Deane, architect, view and plan, vol. xxvii. (1869), pp. 366, 367; and the Laboratory at Eton College, Mr. W. Wilkinson, architect, view and plan, vol. xxviii. (1870), pp. 166, 167.

ULM CATHEDRAL AND ITS RESTORATION.

AT a time when in artistic circles in England no small interest has been roused by the report of the condition of one of our noblest monuments of ecclesiastical architecture, and when an appeal is being made to the public to defray the necessary expenses that will be incurred by the demolition and restoration of the tower of Peterborough Cathedral, there reaches us from Germany the news of the growing interest that is there being expressed in the scheme at length fairly on foot for the completion of Ulm Minster, the largest Protestant Church in the world. Now that the last stone has capped the western tower of Cologne Cathedral and a great national work has been accomplished, the long sadly-embarrassed works of the termination of the great cathedral at Ulm have been promised the interest and co-operation of the Government: the German Emperor has authorised the formation of an important lottery, the proceeds of which are to defray the necessary expenses of a work which, as a national undertaking, is of only secondary importance to that of Cologne. It can well be understood how favourably such a scheme has been received in Protestant Germany.

Not long since we announced in these columns the decision of a committee of distinguished architects respecting the feasibility of the project, and now it is hoped that before the century expires the great tower of Ulm Cathedral will proudly rise into the air. There is something characteristic in this pride taken by the Germans in the noble creations of their past,—a pride which we in England may well envy our neighbours. Rich as is our country in its treasured memorials, we almost doubt whether there exists with us that same national feeling with regard to their beauty as is noticeable on the Continent. Was not a recent American writer on our country justified in his surprise at finding many intelligent Londoners who had never even visited Canterbury Cathedral, the great centre of our religious life, the oldest of our churches, and lying at but a journey of an hour or so from the capital?

Ulm Cathedral, one of the famous Gothic minsters of Germany, has for centuries remained like so many other Continental churches, incompleted, while the religious zeal and intolerance of the past have only further assisted the destructive action of time. Ulm, the home of a wealthy *bourgeoisie*, in the enjoyment of a singular degree of freedom, was, in the Middle Ages, one of the richest cities of Europe. "*Ulmer geld regiert die Welt*," said the proverb which coupled the name of the city with those of Venice, Nuremberg, Augsburg, and Strasburg. That civic pride which has ever been one of the most powerful aids to the development of art led to the determination on the part of the burghers to possess a great cathedral, though it would seem, as so often happens, that the existing result of this praiseworthy conception far exceeded the original plan. A century after the first stone of the west front of Cologne Cathedral had been laid, Burgomaster Krapt, in 1377, laid the foundations of the Ulm Minster, and for many years the works steadily progressed, an army of stone-cutters, masons, and other hands being employed, the expenses defrayed out of town dues and other municipal taxes. In 1392, mention is made in the records of a master, Ulrich von Ensingen, engaged to be *Kirchenmeister*. It has been suggested that the Ulrich von Fissingen who, in 1394, was called to Milan to give his valuable advice in respect to the cathedral works, was no other than the above-mentioned architect. Five years later we find him engaged on the Strasburg Cathedral, where he died in 1419. To Ulrich von Ensingen has been attributed the change of the original plan of Ulm Cathedral, and the enlargement of the conception such as it stands in the present day.

Throughout the whole of the fifteenth century the works progressed rapidly, the beautiful choir-stalls of Jörg Syrlin,—casts of which may be seen at the South Kensington Museum,—as also several of the painted windows by Hans Wild, the wonderful *ciborium*, and a number of wall-paintings, all belong to the active period when Ulm was a brilliant artistic centre. Ulm, let it not be forgotten, is the home of the artistic family of the Schön, of Zeitblom, and Martin Schaffner, the founder of the Swabian school of painting, which, with that of Augsburg, promised, in the glowing days of the Renais

sance, so bright a future for the history of German art, a future, however, singularly eclipsed with the death of Dürer and of Holbein.*

With the fifteenth century ceased the active progress of the cathedral works. Wars and commercial ruin had sadly robbed Ulm of its former wealth; the religious ardour which had raised in Mediæval days such temples as still excite the admiration of the world was, if not dead, greatly changed in its character; a new spirit had arisen, the Renaissance with its distaste to "barbaric Gothic," its new aims, and its powerful allies, the printing-press and the Reformation. The Reformation particularly affected Ulm, which early in the movement deserted the faith of its fathers, and with that fanatic zeal and intolerance which characterised, as, indeed, it still does to some extent, a section of the Protestants, a large number of beautiful works of art were destroyed throughout the city, rich in Roman Catholic relics. The cathedral, itself sadly mutilated, remains almost alone now to tell of the days of Ulm's Mediæval prosperity. Later centuries did little to complete the great Minster. Germany was too sadly torn by the horrors of war to devote its time and hard-earned pence to details so eminently the work of peaceful and prosperous years, and so with slight additions the cathedral came down to our times; its great tower rising like that at Mechlin, square and squat, awaiting the final touch which will now, at length, be put to it. With the early years of this century what interior pictorial beauty still remained was further obliterated under a generous coat of "clean wholesome whitewash," specially intended to cover from public gaze the series of wall-paintings which were accused of superstitious and barbaric ugliness. When only three or so years back the whitewash was removed, several interesting wall-paintings of the fifteenth century were brought to light, and now form no small feature in the interior decorative effect.

The restoration of Ulm Cathedral cannot be said to date from yesterday. Primarily it may be traced to the first projects set on foot for completing Cologne Cathedral. As far back as 1841 a society was formed in Ulm, with the King of Wurtemberg at its head, and the chief aim of which has now been for hard on forty years to patch up the sadly mutilated old monument. Prof. Grüneisen's little work on "The Art-Life of Ulm in the Middle Ages," to which we have referred, was one of the first publications of the Society, which, by 1814, had gathered sufficient funds to undertake the work of restoration. In 1814, under the direction of Prof. Mauch, of the Stuttgart Polytechnicum, and Baumeister Thrän, operations were commenced, and the more urgent repairs taken in in hand. Thrän died in 1870, and was succeeded in 1870, and was succeeded in his post by his pupil Seebold, who, however, died only a year later, his place being filled by Ludwig Schen, a pupil of the Gothic master, Egle. Considerably over half a million of florins had been expended, largely contributed to by the inhabitants of Ulm, but funds were still sadly wanting. A lottery was organised, and the restoration of the interior was commenced. In 1877 the 500th anniversary of the foundation of the cathedral was commemorated, and three years later, at the Congress of Architects, held at Wiesbaden, it was unanimously resolved that the completion of Ulm Cathedral should succeed that of Cologne Cathedral. Early last year the German Emperor gave his assent to the formation of a national lottery for the purpose. The architect Schen had, however, died in 1880 a martyr to his devotion to the work, and Professor Beyer, another of Egle's Gothic school, succeeded him in his post as Baumeister. As was reported in these columns, a committee of eminent architects, among them Oberbaurath Adler of Berlin, Professor Bauschinger of Munich, Oberbaurath von Egle and Prof. Laisgle of Stuttgart, Oberbaurath Funk of Cologne, Oberbaurath von Ferstl and Oberbaurath von Schmidt of Vienna, consulted on the feasibility of completing the huge tower, gave their entire assent to the project, and now the work may be said to be fairly on its road towards completion. Poets are prophets. Goethe a hundred years ago pictured the day when the birds would shelter themselves in the great tower of the cathedral, "God's tree" rising high into the air for eternity *für die Ewigkeit*. Even in its maimed and incomplete condition, the huge cathedral stands proudly like a giant above the houses of the picturesque old town, for Ulm, if not as quaint as Nuremberg or Schaffhausen, is still singularly an honest burgher town of the Middle Ages.

Architecturally, Ulm Cathedral has more than once been described in these pages; in its ground-plan it may be classed as belonging more especially to the purely German Gothic system of a nave and side aisle, each terminated by a separate polygonal choir,—a plan differing, it will be remembered from the older and simpler type of Cologne or Freiburg, which are regarded as being built more peculiarly according to the French rules. In the different types of the basilica and the *Hallenkirche*, the one with its obligatory clearstory, the other without, it is to the former that Ulm belongs, yet differing again from the Strasburg type with its saddle-back roof in having a highly-pitched roof (known to the Germans as a *Pultdach*), obliging a series of flying buttresses connecting the central nave with its aisles, a feature which adds no small element of picturesqueness to the general effect. The original plan was further altered in the sixteenth century by the duplication of each side aisle by a series of slender columns, the cathedral thus possessing in reality five aisles, producing, as may be imagined in so large a structure, an effect of great impressiveness. The dimensions of Ulm Cathedral are indeed only exceeded by those of Cologne.* Exteriorly the ogive portal, cruelly as it has been mutilated, is still an object of great beauty, combining in its details some earlier work of the thirteenth century, introduced from the original parish church which the cathedral superseded. Interiorly, though criticism may light upon the late Gothic character of the many details, it is impossible to deny the imposing character of the general effect. Scattered in various directions are many of the original interior decorations which have happily escaped the mutilations of the past. Foremost among these stand the superb series of forty-eight choir-stalls, the work of Jörg Syrlin, executed, as the inscription notes, between 1469 and 1474. In the history of Renaissance art this work holds a high place, stamped as it is with the classic spirit which so pervaded the great revival. Classic philosophy and mythology and Biblical history find united their expression in the subtly carved heads of Cicero, Pythagoras, Seneca, and Quintilian, in the allegory of the coming of Christ, mingled with the figures of the Sybils and the great Prophets of the Old Testament. Little wonder is it that tradition should have attached to the name of the artist a legend,—resembling that told of many other famous artists,—that the Benedictine monks of Blaubeuren, in whose convent Syrlin has left some of his best work, should have put out his eyes, so that he should not produce for any other convent such admirable creations. The South Kensington Museum, as we have already remarked, possesses an interesting cast of Syrlin's choir-stalls in Ulm Cathedral. The stone pulpit by the second pillar in the nave is a scarcely less decorative work, the cover carved by the younger Syrlin. To the left of the choir stands the *ciborium*, rising 90 ft. into the air, a masterpiece of sculpture,—tradition has stated it to be of "molten stone,"—long believed to be by Adam Kraft, of Nuremberg; but the work of the so-called "master of Weingarten," who in 1469 executed the work for the pious Engel Zaringerin. Mention of the fifteenth-century painted windows of Hans Wild should not be forgotten; nor the font, erroneously attributed to Syrlin, and only contemporary with him,—it bears the date 1470. It shows, however, the skilful and suggestive use made by the late Gothic artists of heraldry for decorative purposes.

The restorers interiorly have been actively at work, the vestibule of the nave with its modern stained-glass windows, is an eminently convincing proof, while the great organ, built in 1856, is always shown to visitors with pride as the largest in Germany,—it contains 100 stops. Exteriorly, the work of restoration has been carried even further, in spite of the deficient funds at the disposal of the architects. Now, however, the work will be taken up with renewed spirit, and if there are some who may regret the changes, the honest burghers of Ulm, and with them Germany at large, will be proud to show their great cathedral completed. Rumours have reached us from Strasburg, where the cathedral also remains spireless, that more than one good citizen is opposed to the change of the old pile and the forms which have been so familiar for many a generation. Doubtless there will be many in Ulm to express the same feelings, as there were in Cologne, but when national pride steps in, private predilections, however cherished and worthy of respect, must give way. Ulm Cathedral must be completed, and with the funds which will soon be placed in the hands of the authorities the work will progress merrily. Once more a picturesque pile of airy scaffolding will break the horizon of the Swabian landscape as it did in the busy Mediæval days when Ulm was very different to the quiet provincial town it now has become, when its armies of workmen tramped through the streets to and from their work, and the noise of many-hammered trades was hushed to silence as the *angelus* peeled over the roofs of one of the great and wealthy cities of Mediæval Europe.*

We give a view of the choir, and shall add some other illustrations hereafter.

* The interesting little book "Ulms Kunstleben in Mittelalter," by Prof. Grüneisen, one of the warmest promoters of the Society, founded now forty years ago, for the restoration of the cathedral, is a work to be referred to by those interested in the history of the "primitive" schools of German art.

* The area of Cologne Cathedral is 6,200 square mètres; of Ulm, 5,100; of Strasburg, 4,100; of St. Stephen's, at Vienna, 3,200; of Freiburg, 2,960; of Ratisbon, 2,400. The height of the nave at Cologne is 44 mètres; at Ulm, 42; at Ratisbon, 33; at Strasburg, 30. The breadth of the nave at Ulm, 15 mètres; at Cologne, little over 13; as also at Strasburg. The west tower of the completed Ulm Cathedral (according to Boblinger's plan) will rise to a height of 151 mètres (495 ft.); while those at Cologne are only 148 mètres high. The Ulm tower at present is only 334 ft. high.

NEW WINDOW IN LEDBURY CHURCH, HEREFORDSHIRE.

In the "Webb Memorial Window" recently set up here, the first and second Advent of our Lord are shown together,—one for the contemplation of the worshipper on entering, the other on his departure. The first coming is heralded by the preaching of St. John the Baptist, "Prepare ye the way of the Lord." This is the first subject at the bottom of the window on the left hand. The second subject is the Archangel Gabriel announcing to the Blessed Virgin Mary that she is to be the mother of the Saviour, and that He should be born of her. The third subject shows our Lord's birth or first coming. Above this is the portion of the window shown in our illustration, the second coming and the following is the text at the base of the subject:—

"But in those days, after that tribulation, the sun shall be darkened, and the moon shall not give her light,

And the stars of heaven shall fall, and the powers that are in heaven shall be shaken.

And then shall they see the Son of Man coming in the clouds with great power and glory.

And then shall He send His angels, and shall gather together His elect from the four winds, from the uttermost part of the earth to the uttermost part of heaven."—St. Mark xiii. 24-27.

In the top of the window our Lord is shown coming surrounded by seraphim; below Him are shown His mother who bore him, as Mercy; behind her is the lily; on the other side is St. John the Baptist, as Justice, with the sword,—She the preacher of purity, He of repentance. In the centre is our Lord's cross (the sign of the Son of Man) borne by angels, whilst beneath is St. Michael with the balance, and the angels with trumpets. Standing on the earth, which this heavenly host is about to visit, are Enoch and Elias witnessing to the world the truth of holy prophecy. Below the window is a brass with the following inscription:—"This window, which illustrates the first and second advent of our Lord, is erected to the glory of God, and in memory of Thomas Webb, of Ledbury, Banker, Justice of the Peace, and Deputy-Lieutenant for the County of Hereford, who died on the 18th day of May, A.D. 1837, aged 61 years; and of Anne, his wife, who died on the 4th day of August, A.D. 1881, aged 102 years. 'Blessed are the dead which die in the Lord, that they may rest from their labours.'—Rev. xiv. 13."

The work was produced by Messrs. Lavers, Westlake, & Co., of Endell-street, Bloomsbury, from the design of one of the firm, Mr. N. H. J Westlake, F.S.A.

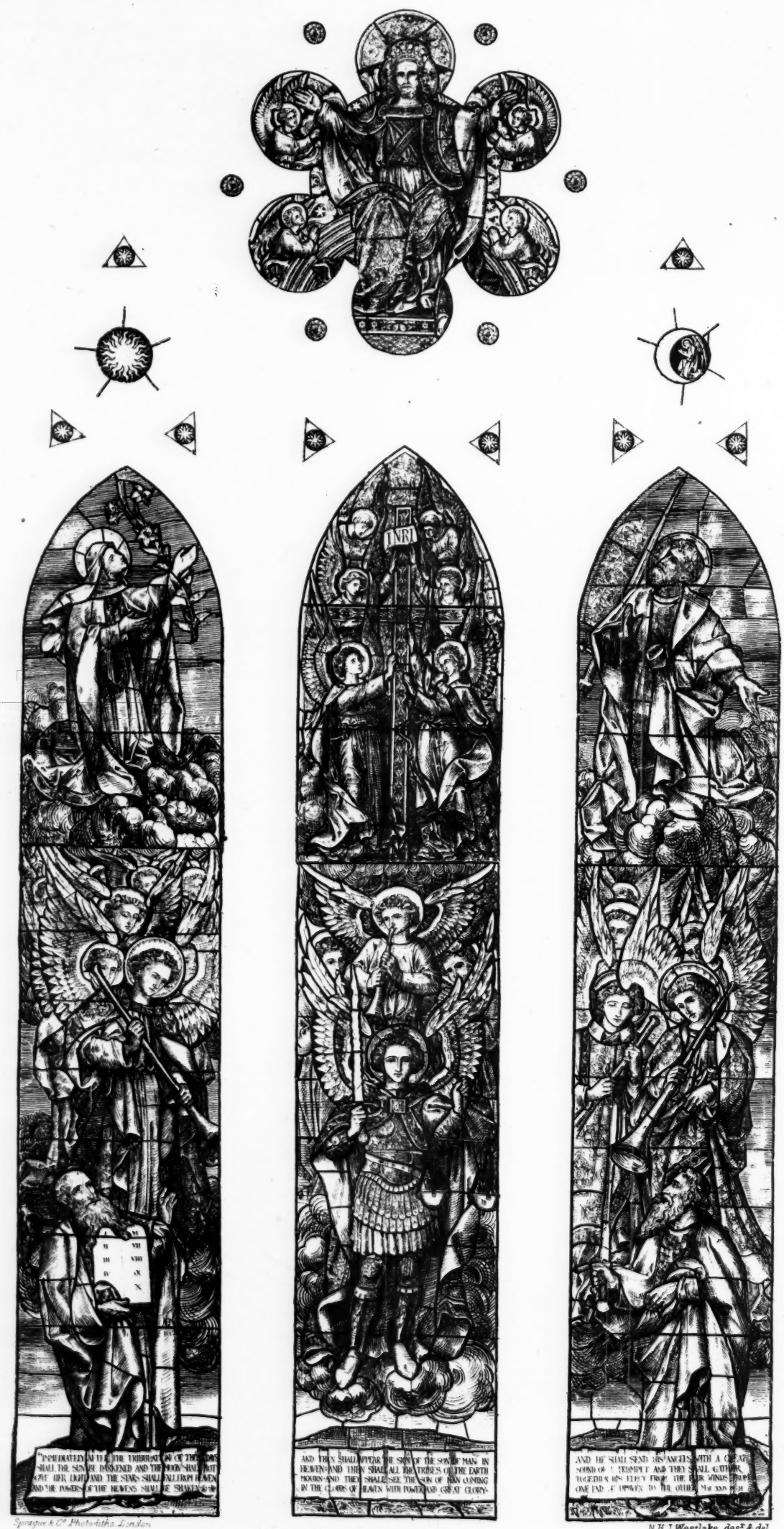
* We recommend to those interested in the subject of Ulm Cathedral, Herr Pressel's work "Ulm und sein Münster," and also his interesting account of the cathedral which appeared, fully illustrated, in the Leipzig *Illustrirte Zeitung* of Jan. 6, of this year.

Whiteman & Bass, *Photo-Litho* 236, High Holborn.

Wyman & Sons, Printers, Gt Queen St.

DESIGN FOR ORGAN.

To Illustrate Paper read by Mr. H. W. Brewer.


I.N.R.I.
VI VII VIII IX X
AND THEN SHALL APPEAR THE SIGN OF THE SON OF MAN IN HEAVEN: AND THEN SHALL ALL THE TRIBES OF THE EARTH MOURN: AND THEY SHALL SEE THE SON OF MAN COMING IN THE CLOUDS OF HEAVEN WITH POWER AND GREAT GLORY.
AND HE SHALL SEND HIS ANGELS WITH A GREAT SOUND OF A TRUMPET AND THEY SHALL GATHER TOGETHER HIS ELECT FROM THE FOUR WINDS FROM ONE END OF HEAVEN TO THE OTHER.

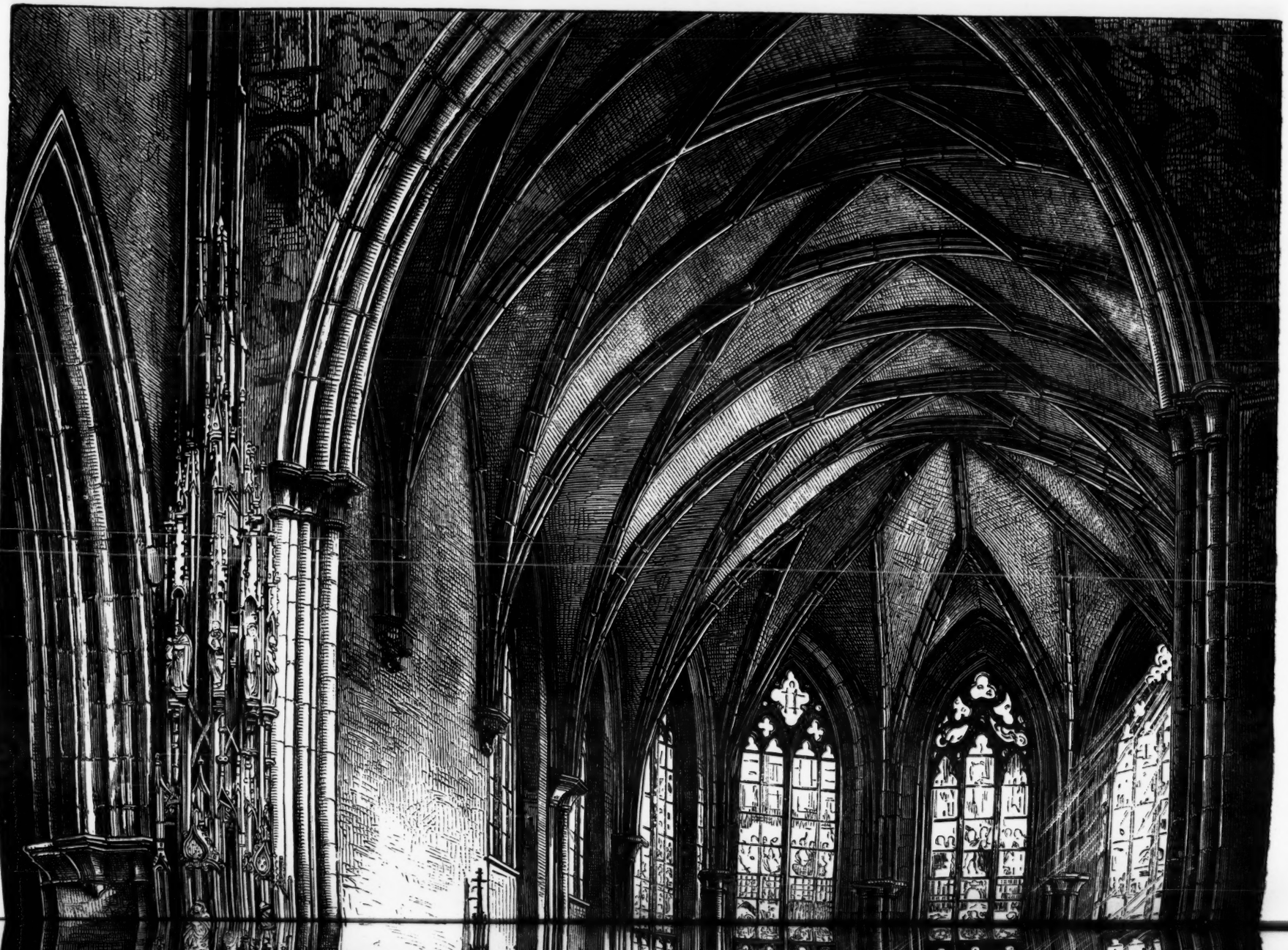
Sprague & Co. Photo-litho. London.

N.H.J. Westlake, des.r & del.

"The Second Advent"

design for the upper portion of the West Window in Ledbury Church.

(Executed by Lavers, Westlake, & Co.).



ULM CATHEDRAL: THE CHOIR WITH THE "SACRAMENTHÄUSCHEN."

Sprague & Co 22, Martins Lane, Cannon St EC

THE WELLINGTON ARCH, HYDE PARK CORNER.

Showing the Arrangements made for Lowering the Equestrian Statue.

THE TRIUMPHAL ARCH AND WELLINGTON STATUE, HYDE PARK CORNER.

THE late Mr. Decimus Burton was, in the year 1825, commissioned to carry out the Hyde Park improvements, which comprised the laying out of the roads and the design and erection of façade and triumphal arch at Hyde Park Corner. The arch was intended to form the principal entrance to Buckingham Palace, but the alterations subsequently effected in the approaches left the arch in what appeared to be a comparatively unmeaning, although a still effective, position. We fear that so much as this cannot be said for the position in which the arch is to be rebuilt, almost at right angles with its present position.* Happily, however, what it loses by change of position it will gain by being quit of the incubus of the colossal equestrian statue of the Duke of Wellington, which was erected upon the archway in 1846, notwithstanding the protests of Mr. Burton and of all persons of taste. We were among the first to raise an objection to this proceeding, the promoters of which should have been deterred from their ludicrous enterprise by the appearance of the wooden effigy which was experimentally set up on the arch in 1839. The statue, it has been officially intimated, is not to be re-erected on the top of the arch.

The illustration which we give this week shows the Archway viewed from the south-west, with the preparations for the lowering of the statue. This operation was commenced on the 24th ult., as already described in some detail by us (see *Builder* for Jan. 27, 1883, p. 122). For convenience sake, however, we reproduce some of the particulars then given. The pedestal on which the statue stood was first of all removed, but before this was done, at each of the four angles, and resting upon the substructure of the masonry abutments of the arch, a temporary pier of brickwork, 6 ft. 6 in. by 3 ft. 6 in., set in Portland cement, and about the same height as the pedestal, was erected. Upon these piers a pair of wrought-iron girders, 24 ft. long, was placed, one on each side of and parallel with the horse. These longitudinal girders are connected at each end by a transverse girder, 20 ft. long, the whole being well bolted together. At the points of crossing the girders are very rigidly bolted together and stayed with massive angle-iron brackets and braces, the bolts being 1 in. thick. This was the more necessary, inasmuch as when the statue is being lifted by the hydraulic jacks, the longer girders are really suspended to the shorter ones, for it is against the projecting ends of the latter, as hereafter stated, that the jacks exert their lifting power. The longer girders have a total depth of 16 in., with a web of ½ in. plate, the flanges consisting of 5 in. by 5 in. by ½ in. angle-irons. The transverse girders are 15 in. deep, having ½ in. web, and 4 in. by 4 in. by ½ in. angle-irons. This rectangular framework of girders serves as a basis on which rest numerous balks of timber, 12 in. square, some placed transversely, and others longitudinally. Between these timbers and the belly of the horse is a massive trussing of timber, holding the group in position, assisted by shores raking downwards and outwards from the top of the cradle-like structure in which the animal seems to be standing to timber balks secured to the tops to the iron girders. The following are some of the dimensions of the timbers: transverse and longitudinal balks resting on iron girders, 12 in. by 12 in.; timbers used in trussing, 8 in. by 8 in., well strapped and bolted together; curb surrounding body of horse at stirrup level, 12 in. by 12 in.; raking struts, 6 in. by 6 in. These timbers were all introduced and built up before the pedestal was removed, the whole weight of the group being carried by them and the iron girders, which, in turn, are supported by the temporary brick piers already mentioned. The ends of the transverse iron girders project some 2 ft. or 3 ft. beyond the ends of the longitudinal girders, and underneath each of the projecting ends is one of Tangye's hydraulic jacks, each, of course, having for its bearing the solid walls of the substructure of the archway, and each capable of sustaining a weight of 20 tons. It will readily be understood from what we have said that, first of all the temporary brick piers were removed, and now the masonry below them is being gradually removed, the statue quietly following in its downward course,—the demolition of the interior portion of the archway and the lowering of the statue advancing, in fact, *pari passu*, so that when, as it is hoped, the statue reaches the ground in safety, the interior of the archway will have disappeared. The statue weighs nearly 40 tons. Its height is 26 ft. 6 in. from horse's feet to top of hat; length from nose to tail of horse, 25 ft. 3 in.; height from feet to underside of belly, 8 ft. It has now descended quite out of sight, and is inclosed by the external masonry of the archway. Altogether it has lowered, up to the time of writing, about 31 ft. The contractors are obliged to stop the lowering operations at this point, in order to get out the soffit of the main arch, and as there is a great deal of work in this it requires some care, on account of its having to be re-erected. Probably it will take some ten days or a fortnight before the statue can reach the ground. The works are being carried out by Messrs. John Mowlem & Co., under the superintendence of Mr. F. T. Reade, A.-M.I.C.E.

Our illustration is a reproduction of an excellent photograph by Messrs. Bedford Lemere & Co., 147, Strand.

* For plan, showing the new arrangement, see *Builder*, vol. xlii., p. 486.

THE ROYAL COURTS OF JUSTICE.

THE CONTRACTORS' CLAIM FOR "EXTRAS."

AT a general meeting of the creditors of Messrs. Bull & Sons, the contractors for the erection of the new Law Courts, held at the Cannon-street Hotel on Monday last, Mr. Dunhill (of the firm of Craven, Dunhill, & Co.) in the chair, Mr. Broad, the receiver, submitted a statement of the debtors' affairs, showing total debts, 81,496*l.* as against total assets, 104,669*l.*, —exclusive, as we understand it, of the claim upon the Government in respect of extra works in consequence of variations from the original contract, in accordance with instructions from the late Mr. Street, amounting to no less than 120,000*l.*

Mr. Brown (of Messrs. Linklaters), called upon by the chairman to give the meeting some information as to this claim, made some extraordinary statements concerning the relations which subsisted between the architect and the contractors. We can find space for only a portion of Mr. Brown's remarks. He said that the Law Courts contract was, as Mr. Broad had told them, the key to the whole of the estate. The date of the contract was February 7th, 1874, and the amount of Messrs. Bull's tender was 719,797*l.* It had been generally stated, and he believed it was true,—that Messrs. Bull's name was originally struck out by Mr. Street, but was restored by one of the officials of the Office of Works, and their tender was accepted. After the tender was sent in the figure was reduced, some items being struck out that were included in the original bills of quantities. Roughly speaking, it was a contract for 700,000*l.*, but some of the very matters struck out were subsequently re-introduced into the contract, and formed part of this very claim for extras. He was informed by Messrs. Bull, and he had no reason to believe to the contrary, there was not a single item in the contract in which the prices had exceeded the original estimate. Then, as to the second question, the specification had not been adhered to, but from the moment the contract was signed, Mr. Street devoted ingenuity to alter it in every way. There had been thousands of alterations, some affecting the largest items in the contract. Universal experience showed that when a large building contract was altered from end to end it was impossible for an employer to object to having to pay a considerable bill for extras, and, further, such alterations largely increased the expense to which the builder was put. The actual expense should not have exceeded 585,000*l.*, but the books, which from beginning to end had been carefully kept, showed that upon the works and materials there had been expended in actual cash, 723,000*l.*; upon plant, 26,700*l.*, less the knock-down value, 3,000*l.*, which totalled the actual cost to Messrs. Bull to 746,700*l.*, as against th 580,000*l.* which ought to have been a fair outlay upon the contract, or 160,000*l.* more. That excluded all payments for financing, or interest of any kind whatever. If to that was added what the contract price should have been on such an expenditure, allowing 35,000*l.* for financing interest and contractors' profit of 14 per cent.,—in all, 139,538*l.*, the price would be brought to 886,000*l.* Now, as a matter of fact, they had received from the Government up to the present time only 724,000*l.*; they had retentions in their hands of 10,000*l.*, making 734,000*l.* This would leave a balance in favour of Messrs. Bull & Sons at the present moment of 152,000*l.* still to be received. In the statement it was put at 120,000*l.*, which was assuming they got a profit of less than 10 per cent. upon a contract of that description. Now, as offering some further test of these figures, if they took into account the expense for extras which had undoubtedly been incurred, they not having been contemplated when the original tenders were sent in, and add it to the average amount of the tenders made by the eighteen other firms who competed, they would find it would come to very much like the sum he had mentioned as a fair price to be paid for the work. Now as to the third question, whether they had been fairly treated, notwithstanding the enormous alterations he had made, and the expense he had incurred in consequence, Mr. Street had stated that he was only prepared to certify for 10,000*l.* for extras over the whole contract. Now, he (Mr. Brown) ventured to say that, looking at the contract, it was impossible that a building of such magnitude could be carried out with only 10,000*l.* spent in such a way upon it; the statement was utterly absurd, and it was preposterous that any public official should pretend to be misled by it. First of all, there were certain ascertained extras practically agreed to within certain limits, amounting in themselves to 11,000*l.*; and there were day works which had been done from time to time, and were never disputed by the architect until eighteen months after, although, if there was any question, it was to be raised in seven days,—these were therefore practically undisputed,—amounting to 25,000*l.* Next, there was an item in connexion with what were called joggles. The tender was made upon the assumption that the stonework was to be joggled, but the Government, to cut down the price, struck it out of the contract. As soon, however, as Messrs. Bull began to do the work, they were required to put joggles, but they went on with their contract as they had been going, whereupon Mr. Street sent his man, saying he would throw down the work with crowbars, and having forced Messrs. Bull to put joggles in, he refused to pass it as an extra, it being now thrown in their teeth that no written order was given them for it. The item alone came to 17,000*l.* Then there were certain groined arches throughout the building, and the character of the work on these had been radically altered, and made very much more expensive. The sum of 2,500*l.* had been claimed in respect of that, and he thought there was very little doubt it could be established. Then there was an item for rubbing the stonework throughout the building. Mr. Street insisted on its being done at a certain time, contrary to representations that were made to him, and the consequence was it had to be rubbed over again, the claim for this being estimated at something like 10,000*l.* There was a claim in regard to the last block amounting to 2,500*l.* The amount of the claims within ascertainable limits was 67,000*l.*, and he would now give an item which they could not put a figure on for the moment. Those who had been in the Law Courts would have seen that along each corridor there were channels in the stone work, to hold hot-water pipes and so on. The corridors were many miles in length, and the stone channels which the contractors had to make were not included in the original contract. That item alone would amount to many thousands of pounds. Then, too, there was a very large claim for the obstruction and delay of the work caused by the work of other contractors without any consideration for Messrs. Bull's convenience. Then there was an item in respect of roofs and ceilings. In the contract drawings, one design was given for the whole of the roofs of the eighteen different courts. The contract, however, was no sooner signed than Mr. Street insisted that the roof of each court should be of different design, and thus cast a great additional expense upon the contractors, but he had refused to certify for one farthing, although it had necessitated new patterns, &c.

It was resolved that the affairs of the debtors be liquidated by arrangement and not in bankruptcy, and Mr. W. H. Davis and Mr. Broad were appointed joint trustees to the estate, with Messrs. Oliver, Dunhill, Dominy, and Reid as a committee of inspection.

OF ARCHITECTURE AND DECORATION.*

"Truth in opposition to the world."

"Truth is uniform and narrow, error endlessly diversified; in the field of truth the mind is passive, in that of error she expands and displays all her boundless faculties, all her beautiful and interesting extravagances and absurdities."

IT matters little the style of architecture selected or adapted for modern buildings provided that utility, guided by reason, be allowed to prevail. Architecture and building are essentially necessary for the bodily protection of mankind from the influence of the weather, and decoration connected with the fine arts is desirable for softening the mind so as to subdue and regulate otherwise ungovernable passions. It is therefore a grave mistake to endeavour to substitute decoration for the more useful and important details of architecture.

All objects of imitation, like the materials of human knowledge, are a common stock, which experience furnishes to all men. And it is in the operations of the mind upon them that the glory of science consists. The fondest admirer of ancient art would never pretend that Palladio had copied Vitruvius merely from his working with the same materials of wood, stone, or marble, which this great master had employed before him. But were the general design of these two architects the same in any buildings; were their works conducted in the same style, and their ornaments finished in the same taste, every one would be apt to pronounce on first sight that the one was borrowed from the other. Voltaire truly said that "originality is nothing but judicious imitation."

Although it is most desirable to admit the public to museums, galleries of art, exhibiting architecture, sculpture, painting, flower-gardens, and other repositories of the animal, vegetable, mineral, and art kingdoms, still without educated masters to describe and elucidate the various leading points connected with form and colour, the exhibits to a great extent will be, as they now are, lost upon the uneducated and uncivilised multitude. I recollect having read somewhere or other that at the time when Stuart and Revett and the Dilettanti Society issued their beautiful works on Grecian architecture, a desire was expressed to visit Athens and its temples, buildings, and works of art, and a pilgrimage was made for a personal visit to the scene of such beautiful works. Imagine the disgust and disappointment experienced by the tourists exclaiming upon their return, that there was not anything to be seen but *débris* and unintelligible ruins and fragments. Another visit was consequently made to the Classic scene, and after the beauties had been pointed out to the tourists, and their minds educated or expanded to understand and appreciate the objects in question, the result was, of course, eminently successful, and a due and proper appreciation was obtained. Obviously it requires that all specimens, whether of nature or art, should be lucidly set forth by teachers properly educated for the purpose, otherwise the public will not realise the intrinsic value and importance of what they see.

Scientific teachers are not sufficiently remunerated, and they have a great dislike to popular knowledge. They would not now follow in the footsteps of the "Society for the Diffusion of Useful Knowledge," which about sixty years ago rendered eminent service with a view to popularise knowledge, and its efforts have never been surpassed.

The teachings of Joseph Gwilt and Owen Jones to the effect that colour is of more importance than mouldings, and that mouldings may be dispensed with, are now exercising a pernicious influence. The result is that in lieu of moulded cornices, dados, panels, &c., decorated papers are now substituted. Colour when judiciously used to increase the light and shade of architectural details is most valuable.

In a lecture given in aid of the Society for the Protection of Ancient Buildings, in the South Kensington Museum, on "Decorative Art," on April 5th, 1882, Pompeian paintings were alluded to; the only guide, observed the lecturer, "was that detestable Pompeian Court at the Crystal Palace, where the grossest colours were shown"; and that Mr. Jones's book was the only one which gave anything like a consistent history of the illustration of decorative art, "but for all that he [the lecturer] would like to have that book at the bottom of the sea."

* By Mr. W. Pettit Griffith, F.S.A. Read before the Liverpool Architectural Society on the 7th instant.

Although not concurring with Owen Jones in substituting colour for form, I cannot agree with the lecturer (a Royal Academician) in severely condemning works produced for the education of the people. The absence of correct taste displayed in the several Fine Art Courts of the Crystal Palace is likely to do much less injury than the good which the courts themselves will effect by setting the example of increased architectural embellishment. Neither can I endorse the lecturer's conclusion, that to propound general principles was not of much use, and that for good taste there were no rules.

It may be true that there is no just standard by which we may estimate the contour of beauty excepting that forcible and convincing impression which always follows the perception of an admirable object. Yet no real progress can be made in true taste without the most assiduous study of those rules which, whether "springing originally from the cold formalities of mathematical science, or proceeding from the inspired brain of an original inventor, have undoubtedly constituted through all time the guardians of sublime ideas and the nurses of quickening genius."

It is more easy to destroy and declaim than to invent or create, and it must perplex art students to be told that for good taste there are no rules. Mr. Mundella, also, at the West London School of Art, in December, 1882, seems to have forgotten that perfection is of slow growth, the more especially when he stated that "it appeared to him in 1851, and he held the same opinion still, that if all the British art work of the first half of the present century, in its wall-papers, its decorations, its hangings, and its very heavy furniture, had been collected in one vast pile and burned up, the world would not have been any the worse for it."

In 1872, see the "Grammar of Architecture," in the *Builder*, attention was directed to the importance of mouldings, and reference was made to Sir W. Chambers, who accused our greatest architects with having too much neglected the detail, it being the duty of an architect to attend to the minutest object, as well as to the most considerable. By so doing, he says, a practitioner may distinguish himself from the common herd of architects. The most masterly disposition, incorrectly executed, can only be considered as a sketch in painting, or as an excellent piece of music performed by country fiddlers.

The study of architecture requires to be carefully and nicely handled, and it must not be overlooked that the mouldings form the very grammar of the art; without them all buildings would be senseless masses.

It is of more importance just now than at any other period, that the proper use of good mouldings should be encouraged, as powerful temptations are offered to force the employment of colour, in lieu of form, upon the architecture of the day. The rage for decoration and colour has completely subverted all reason and common sense, so essentially necessary for the proper construction and utility of practical architecture.

Architecture at the Society of Antiquaries and the Royal Academy, if not actually ignored, has been, as is well known, neither fairly acknowledged nor represented. The former society, eminently useful in aiding literature, has more respect,—

"for monuments that have forgotten
Their very record."—BYRON.

than for the useful and beautiful teachings of architecture. By architectural archæology,—

"Ye shall be taught by ruin to revive
The Grecian forms at least from their decay,
And Roman souls at last again shall live
In Roman works wrought by Italian hands;
And temples, loftier than the old temples, give
New wonders to the world."

Architecture, as fostered at the Royal Academy, is scarcely practical, and may be compared to,—

"some free design,
Where breathing Nature lives in every line;
Chaste and subdued the modest lights decay,
Steal into shades, and mildly melt away."—COLLINS.

thus leaving no lasting lesson to enable the young architect to gain his living, by rendering himself practically useful to mankind.

Much has been written, from time to time, on the subject of shams in architecture and decoration. Each generation has to be educated, and perhaps it would be unreasonable to expect that the rising architect should be required to make himself acquainted with all that has been written or said in the matter. To the senior members of the profession these grievances are, of course, well known; but the public, who rarely observe or think without guidance, are entirely misled. It will, consequently, not be unprofitable, either to the young architect or the public, to direct attention to the want of common sense, often exhibited in many of the works of the present period. . . . .

There is not anything more common and humiliating to an educated eye than the universal modern system of supporting roofless gables, pinnacles, arches, statues, and chimney-shafts, with iron rods and bars. Had this miserable and mechanical system been pursued by our ancestors, there would not have been handed down to us even the time-worn, yet beautiful, remains of architecture, now the admiration of all intellectual observers.

The introduction of gablets on the sides of churches, town-halls, and other buildings to convey the light to the central parts of the interior was practicable and serviceable, but the modern system of employing gables for the sake of ornament, or appearance, or of breaking a monotonous horizontal line, leaving the apex of the windows on a line with, or below, the gutter-plate, is truly ridiculous.

With the introduction of the valley or V-roofs, originated another sham of a dangerous character. Independently of the weight of the roof, cast upon the partitions, walls, and floors, producing fractures and instability, the carrying up the screen walls, parapets, or inclosures, to form horizontal fronts, with no sustaining roofs, has led to serious consequences.

On December 18, 1881, a terrific gust of wind, swept across in a direct line from St. Pancras Church, in Euston-road, to the Grecian Theatre, in the City-road, and taking that as its direct course was felt with equal violence for a quarter of a mile on either side. In River-street and Green-terrace, Clerkenwell, where valley roofs abound, the screen walls or parapets, with portions of the roofs above alluded to, were blown into the road below.

To avoid similar calamities, all valley roofs should be finished with gables, so that the wind can uninterruptably pass through. It would, however, be quite as economical, and more safe, to have span or curved roofs, and thereby avoid all settlements in the structures, and at the same time affording a security against high winds and tempests.

"This is my method, though I sometimes stray
From Euclid's rigid rules to fancy's way."

It would be well to avoid tall chimneys on lofty buildings, often erected to produce a picturesque effect. Houses in a valley or on a low level, sometimes, of course, require the chimneys to be elevated.

Another miserable and dangerous innovation is a flat ceiling, ribbed and panelled with pendants, executed in plaster, with a paper cornice, instead of the wooden ceiling, formed with properly moulded ribs divided into compartments, and supported by a moulded cornice round the walls.

Of inconsistent shams, the recent so-called *restorations* of some of Wren's Classic London churches afford examples. Decorating columns in the centre of the shafts, with painted flat-moulded bands, is unreal and absurd. Paving the floors of the nave and aisles with wooden blocks similar to stable-paving, set in herring-bone fashion, will also not answer; although it is urged that matting will not be wanted. No washing will make these floors decent; the old-fashioned paving tiles were in every respect preferable for wear and appearance, even if unornamented.

The repeal of the window-tax, or tax upon light, health, and morality, produced a revolution in the architectural character of windows, by encouraging plate glass and increased light generally. A retrograde fashion or movement is now in vogue, encouraged by Government half-educated incapables, of contracting window openings, and glazing them with small lead quarry lights, with painted, stained, and cathedral glass. In a sanitary point of view, no residence, however *picturesque*, can be considered healthy, that is deficient of light and air. Hence the folly of re-introducing the productions of the days of Queen Anne:—

"All smatterers are more brisk and pert
Than those that understand an art;
As little sparkles shine more bright
Than glowing coals that give them light."—BUTLER.

What a blessing it is that Nature, when she invented, manufactured, and patented her

authors, contrived to make critics out of the chips that were left.

Twisted columns, though affording very pleasing curves to the uneducated eye, are universally acknowledged to be less beautiful than the common and regular columns. In the case of furniture, however, fancy or taste can be excrcised with more freedom; still a seasonable admonition may be given to those who design the furniture of our time, to relinquish their vain hopes of *originality*, and turn themselves to a stricter imitation of the best models. But to stimulate their endeavours to this practice, the public taste should be reduced, by sober criticism, to a just standard.

The domestic furniture of our ancestors consisted of Mediæval tapestry, somewhat similar to the needlework hangings described in Homer. The art of weaving tapestry, which had been previously manufactured by the needle only, was first introduced into Europe by the Flemings. Planché says that "the fashion of hanging the walls of cathedrals and churches with tapestry, on great festivals, prevailed so much in the eleventh century, that it was denounced as a vanity by the Clunese order of monks, notwithstanding it had received the sanction of a St. Gervais, abbot of St. Rignier, who had some remarkably fine tapestries made for that especial purpose."

The ark of the tabernacle, 490 years before Christ, affords an illustration of the early use of tapestry or hangings of fine-twined linen, wrought with needlework, the colours selected being blue, purple, and scarlet. The hangings were suspended by silver hooks, on pillars of brass or wood, overlaid with gold, and filleted with silver, and set in large sockets of brass. The only entrance was at the east end, and the tabernacle was at the west end. Following the Hebrew example, the early Christian Churches placed the holy table at the west end, and not at the east. This, no doubt, was considered important, as in the "Morrow of the Mathematicks," printed at the Three Bibles, on London Bridge, 1710, we are informed that Hebrew is the language we shall speak in heaven,—the original language of all others,—and that High Dutch is as ancient as the building of Babel.

About 1,000 years before Christ tapestry was used for bed-furniture (see Proverbs vii. 16),—"I have decked my bed with coverings of tapestry, with carved works, with fine linen of Egypt."

Tapestry was introduced into Europe by the Crusaders, the English and Flemish being the first who distinguished themselves in making it.

In the twelfth and thirteenth centuries the art progressed rapidly, in consequence of the increasing demand for a material which clothed the cold, comfortless stone walls of the castles and mansions of the nobility, and not only gave warmth and cheerfulness to the chamber, but frequently illustrated the actions of its owner or his chivalrous ancestors.

During the thirteenth and fourteenth centuries, there can be but little doubt that the looms of Flanders and France produced tapestries of greater richness of colour, and much improved character of design. Heraldry began to lend its powerful assistance to effects both of outline and colour, and "balls of worsted," of green, blue, and other grounds, covered with the armorial shields or badges of the nobles and knights of Christendom, are to be found specified as valuable furniture or affectionate bequests in hundreds of documents of that period.

The invention of paper-hangings, which dates about the beginning of the seventeenth century, probably tended to check the demand for the more costly article of tapestry.

Of the "Influence of Fashion in Architecture" (see the *Builder*, vol. xxi., p. 38), the power exercised by fashions has a wider range than architecture; permit me to mention dress,—too nice a subject, indeed, for an architect to pretend to any skill in it. When man walks he plants his whole foot on the ground, and is termed a "plantigrade"; a lady who walks on her toes and raises the heel from the ground, is known as a "digitigrade." This, in combination with the "Grecian bend," presents a humped back. Wren, in the "Parentalia," says, "The women, as they make here [Paris], the language and fashions, and meddle with politics and philosophy, so they sway also in architecture: works of filgrand and little knacks are in vogue."

Although the origin of fashions was to conceal deformities,—such as long coats to hide the ill-made legs of Charles VII. of France, and shoes with very long points, fully 2 ft. in length, to conceal a large excrescence on one of Henry Plantagenet's feet,—still it is to be deplored that the beautiful forms of the more perfect should be hidden and good taste destroyed. The Court, in all ages and in every country, have been the modellers of fashions; so that all the ridicule, of which these are so susceptible, must fall on them, and not upon their servile imitators the public.

Our ancestors in the furniture of their houses were, in the upholsterer's department, even so late as the latter part of the sixteenth century, provided with but rude accommodation; but their tapestry bed-furniture, and the magnificence of their plate, far surpassed similar articles in modern times. Carpets were rarely used, and in the description of an interview with Queen Elizabeth at the Palace of Placentia, at Greenwich, in 1598, which appears in the travels of Paul Hentzner, a German, it is stated:—"We were admitted by an order Mr. Rogers had procured from the Lord Chamberlain, into the presence-chamber, hung with tapestry, and the floor, after the English fashion, strewed with hay [rushes], through which the Queen commonly passes in her way to the chapel."

The Society of Arts, in 1754, gave the first exhibition of designs for decorative purposes. The example was not followed in France till September, 1798.

In 1852, the Government formed, in the once town residence of the Duke of Marlborough, a temporary exhibition, termed by art-critics a "Museum of Horrors," as the objects illustrated indicated what to avoid, and not examples to be imitated, such as "horrible carpets, hideous tapestry, wall papers shocking by their ugliness, revolting stained glass, and wretched ironwork, all embodying bad form or bad colour."

The Great Exhibition of 1851 opened up fresh and more important stores of art, both useful and ornamental. The example set by this exhibition has been, not only repeated in this country, but all civilised countries throughout the world.

Every country has its own style of decoration, which may be best gathered in its native soil, and every age must, therefore, be allowed its proper character and commendation.

In 1878 a competition was instituted by the Council of the Society of Arts, as trustees of the sum of 400*l*., presented to them by the Owen Jones Memorial Committee, being the balance of the subscription to that fund, upon trust, to expend the interest thereof in prizes to "Students of the Schools of Art who, in annual competition, produce the best designs for household furniture, carpets, wall-papers, and hangings, damask chintzes, and regulated by the principles laid down by Owen Jones."

In all public and private buildings the size or proportion of each room has to be determined prior to the selection of suitable decorations. A duly-proportioned room, inharmoniously decorated, is more agreeable to the eye than an ill-proportioned room tastefully ornamented. By internal proportions is meant the disposition of the three dimensions of length, breadth, and height, which is necessary to render a room or apartment beautiful or pleasing in its form. Sir W. Chambers says that the proportions of rooms depend, in a great measure, on their use and actual dimensions.

Architectural dados round dining-rooms, studies, &c., consisted of a base or skirting, dado, and cornice or chair-rail. The unmeaning introduction of ornamental-paper dados, omitting the moulded cornice or chair-rail, and substituting a paper border, completely mars the architectural character of rooms. This is to be regretted, as an imitation marble dado, with a border top and bottom, could be with propriety and good effect introduced between the base or skirting and the properly moulded cornice or chair-rail.

It is well to point out inconsistencies, as, in an age of tinsel, sage and pithy reflection is a novelty.

> "Each petty critic can objections raise,
> The greatest skill is knowing when to praise."

It should also be noted that,—

> "Change grows too changeable, without being new."
> BYRON.

Paper cornices or borders may be acceptable and appropriate for cabins on board a ship; they, however, have a poverty-stricken appearance when used in the rooms of dwelling-houses. In a sanitary point of view walls should be lined with polished marble, enamelled slate, glazed bricks and tiles, or varnished woodwork; in fact, all non-absorbents are to be preferred to papers, and these, when used, ought to be made washable by being varnished.

It is, by far, more natural, less artificial, and more durable, to line the interior of buildings with marbles, as in the Pantheon, at Rome, than to resort to painting, especially in our climate. Besides, polished marble copiously reflects the rays of light; all kinds of polished wood in ornamental furniture likewise are beautiful for the same reason.

Hesiod, 944 years B.C., in his "Shield of Hercules," says,—

> "O'er his breast he fitted close
> The corslet variegated, beautiful,
> Of shining gold."

Hanging long rows of china plates, and placing crockery on shelves and ledges, may be very convenient in a kitchen and necessary for collectors, but very offensive to an educated eye, even if the colours be harmonious, because they are deficient in mind, and are no better, if so instructive, as the walls of savages hung with the scalps of their victims or enemies, which to them are equivalent to historical paintings, of which they know nothing.

It is equally absurd to tint or paper rooms to set off to advantage the complexion of the company, as no two faces have the same colour the like as regards ventilation,—the air which is refreshing to one person is a draught to another. The atmosphere of the room ought to be agreeable to all, without an undue heat or draught.

It has been observed that when you enter a room, it should present to the eye a harmonious whole, so that no one part in particular claims attention. Thus:—

> "Colour and form alike their powers engage
> In trophies of the proud baronial age;
> Azure and crimson, green and gold, unite,
> Friezes and chapiters, in glory dight,
> Blaze with imposing splendour o'er the sight;
> Enamell'd flowers their graceful foliage twine,
> And pictured mouldings thread the golden vine;
> Fair in their form, and glorious in their hue,
> They blend harmonious, and the mind subdue."

There is a prevalent fault in using stuffy decoration. It has been well observed that there is a "sort of skill displayed in the conjunction of dull-greens, dull-browns, dull-reds, and dull-blacks that produces the effect on one of breathing used-up air; the instant you come into a room decorated in this wise you gasp for a breath."

With respect to hanging paintings and water-colour drawings, there is no great diversity of opinion as to the tints of the walls suitable for their reception.

For a pavilion Byron says:—

> "From my mansion in the cloud,
> Which the breath of twilight builds,
> And the summer's sunset gilds
> With the azure and vermilion,
> Which is mix'd for my pavilion."

All rooms are, more or less, enlivened by flowers, particularly drawing-rooms; care should, however, be taken and the judgment exercised in grouping them, so as to harmonise or contrast one with another. This should be confided,—

> "To no mean hand, and asks the touch of taste,
> Here also grateful mixture of well-match'd
> And sorted hues (each giving each relief),
> And by contrasted beauty shining more is needful."
> COWPER.

Mr. J. D. Crace complains of the furniture in the drawing-room being "always restored to its proper place; no books but the 'elegantly-bound' are allowed to repose on the table, newspapers are swept away, the only signs of writing are an impossible ink-stand and blotter placed where no one could see them." Mr. Crace seems to forget that the drawing-room is neither a reading-room nor a library, but a conversational reception-room.

As the education of the people advances, ecclesiastical vestments and church decorations will, or ought to, become of minor importance, that is, if the Rector of Billingford, in Norfolk,* is to be credited. He says: "I look upon these habiliments or trappings as an inoffensive mode, employed solely to give religion and its professors a proper consequence in the eyes of the unthinking vulgar."

Disraeli confirms this when he says the Catholic religion has ever considered the pomp of the clerical habit as not the slightest part of

* Tindal's Excursions in Literature and Criticism, 1791.

its religious ceremonies; their devotion is addressed to the eye of the people. Although pure and undefiled religion ought to be guided by reason; still, as Dr. Johnson remarks, "fine clothes are good only as they supply the want of other means of procuring respect."

Sturm, in his "Reflections," says we are still young in knowledge, and very ignorant of the true and pure tenets of religion, which still labours to throw off the shackles of ceremony and the yoke of superstition, with which the ignorance, the presumption, and the audacity of man has obscured her simplicity and sullied her purity.

In natural productions, uniformity, regularity, symmetry, &c., well known to be agreeable to the eye, are solely based upon utility; hence the absurdity of any attempt to separate the ornamental features from the constructive. Akenside was of this opinion when he asked,—

> "Can beauty dwell
> Where health and active use are wanting?"

Finally it will be seen that in architecture and decoration, notwithstanding there are certain laws, rules, or principles necessary to be followed, much has to be left to the discriminate or educated and practical eye, to decide upon the various points to be observed in each case, prior to a successful verdict being obtained as to the best result, and ultimately the old adage will have to be appealed to, viz.:—

> "'Tis use alone that sanctifies expense,
> And splendour borrows all her rays from sense."

THE CONSTRUCTION OF THEATRES.*

THE construction of the modern theatre, in the rapid increase of these buildings which we have witnessed within the last few years, presents many points of the greatest interest to a society like the one I have the honour of addressing, inasmuch as though the finished aspect of a theatre is due in great measure to the work of the architect and decorator, yet the shell of the building has now to be designed, in order effectually to meet its requirements, with the utmost attention to the latest principles of science as exemplified in the most advanced engineering skill of the present day.

It has been said that theatres are the only important buildings of modern times designed wholly without reference to precedent, and this proposition being admitted, it follows that, in one respect at all events, the subject is suited to the consideration alike of architect and engineer; the former, to work successfully, follows precedent for the most part, while the latter is ever seeking new inventions, and making use of new combinations of materials. Good building, and therefore in a wide sense good architecture, is the result of the united efforts of the engineer and architect. It is not given to one man to be a successful follower alike of both callings, and few better subjects than a theatre could be chosen for members of both professions to meet on friendly footing and together design the building, the one to exhibit "the beauty of fitness" to its utmost degree, and the other to complete the edifice and enchant the senses, making that "music of the eye," which has been aptly applied to noble architecture.

Now, the subject being a large one, I must necessarily divide it in some form, and confine my remarks more particularly to the construction of the auditorium. The exterior of a theatre is a wide subject, and, being purely architectural, I do not purpose touching it, and as to the stage generally, to describe its construction would occupy a whole evening alone. We have, then, to consider the best mode of constructing a theatre in the present day, and more especially for this country. A few years ago it was said "that foreign theatres are of no possible consequence to Englishmen." An English theatre is nearly always built on a close and confined site. The architect's difficulties are increased by want of funds as well as want of space. On the Continent the State assists the work, and the site is commonly open and well selected. Their audiences go thither under very different impressions, and the habits of foreign nations differ so materially from our own that it by no means follows that what is wanted abroad is therefore required here. Admitting this, yet I should like to run through a short *résumé* of the principal ancient and existing theatres, as it may lead us the better to understand the consideration we have in view.

We are all familiar with the form of the Ancient Greek and Roman theatres, and we all know how excellent that form is both for seeing and hearing. As to the latter, Saunders (1790) relates how at Verona the custom was to erect a stage on summer evenings in the arena of the old amphitheatre, and as spectator he sat on the top row of seats and heard distinctly the voice of the actor at the distance, in a direct line, of about 160 ft. (In the Albert Hall the distance from the speaker to the back of the picture gallery is 186 ft., and the width across 232 ft.) To assist the sound over these vast tiers of seats the Romans placed in cavities at settled intervals under the seats musical vases answering to the different notes in music, which strengthened and spread the sound to every part. The effect of these vases has been doubted, but surely so practical and scientific a people would never have repeated their use from time to time had they not been effective. The seats in these theatres rose in the form of an amphitheatre to the extent of a semicircle, the whole of the orchestra likewise formed a semicircle, the diameter of which formed the front line of the stage. In these buildings the auditors hear principally by direct natural radiation of the voice. The stepped semicircle of seats stopped against a lofty wall with a deep and wide central recess in it which formed the scene. The stage elevated to a considerable height occupied a space in front of this central scene, and the Greeks differed from the Romans in projecting their orchestra at a lower level in front of the stage into the arena. The lofty enclosing wall round and above the topmost row of seats,—often with a range of columns against the inner face,—kept the sound within bounds and formed the support for the velarium. Saunders was so much taken by the circular form that he published a plan showing the seats all arranged round two-thirds or more of a circle, but it does not appear to have met with approbation, as I am not aware of its having been carried out.

The ancient forms suited very well for daylight performances in fine weather and dry climates, but a different state of things at once arose when the erection of a permanent theatre was determined upon. The oldest permanent theatre still standing is that of the Theatro Olympico at Vicenza, built by Palladio, according to the principles of Vitruvius, in the latter half of the sixteenth century, and in 1639, Richelieu built the original theatre of the Palais Royal, which was long considered the type and model to be followed in the design of such structures. In the same year a theatre was erected in Venice with two tiers of boxes arranged circularly round a pit, sloping backwards as at present, thus really inventing the present form of theatre; and in 1675, Fontana first introduced the horseshoe form in a theatre at Rome, known as the Tordinoni.

The theatre at Bordeaux is said to be the most magnificent of its class in Europe; it was commenced in 1773, and occupied seven years in building. In the auditorium a Corinthian order was introduced, running the height of three tiers of boxes, and however grand its classical effect may be, the interruption of sight by the columns is a defect which cannot be repeated in the present day.

No mention of theatres would be complete without a word or two on the great La Scala at Milan, completed in 1776, thus more than a century old, and still, perhaps, the best lyric theatre in existence, as well as the largest. From the curtain to the back of the boxes is a distance of 105 ft., but the stage projects some 19 ft. in front of the curtain, with stage boxes on either side. The width across the back of the boxes is 87 ft., 71 ft. 5 in. between the fronts, 96 ft. from the curtain to the box front, and 69 ft. high from pit floor to ceiling. The width of curtain is 49 ft., and the depth of stage 77 ft. There are seven tiers of boxes similar in extent and height, and the grandeur of its internal appearance is due, no doubt, to this extreme simplicity of arrangement. Its acoustic properties are good, but the upper tiers near the stage must be extremely inconvenient. Across the passage round the boxes is a small *salon*, or cabinet, belonging to the box adjacent where supper can be served. It was from Italy that the fashion of closed boxes came, as there the audience receive visitors or play cards during the evening.

San Carlo at Naples, built in 1816, on the site of an older building which had been burned, is another grand theatre: its dimensions are only a foot or two less either way than the Scala. The width of curtain is, however, more, being 53 ft. The stage projects a similar distance, and underneath this projection is placed the orchestra. The pit of San Carlo seats 742. Its internal appearance differs considerably from La Scala, as there are six ranges of boxes and they are wider on plan, thus lessening the accommodation and reducing the scale to the eye.

We can admit the magnificence of these edifices from the point of view that the audience come together to see each other as much as the play, but only a limited number can see the stage well or the acting at all. There are no balconies, no receding of the circles in the upper stages, and no inclination of the fronts towards the stage; in a word, no effort has been made to give all alike an equally good view. All these improvements have been reserved for our own time. As to the receding of the upper tiers, Saunders was the first to call attention to it in 1790, and he, though very sound in many of his deductions, gives a curious reason for its adoption. He says, "The receding of the upper gallery has always been found of utility on account of the noise and clamour continually raised there by an English audience."

We had nothing to compare with the great Italian theatres until Novosielski rebuilt the Opera House in the Haymarket in 1790. Mr. Warington Taylor, writing in 1864, remarked it was the very best theatre in the world for sound, and, he adds, it was certainly built without any scientific principles of acoustics. In shape it was like a drum, and the wall of the auditorium was flat. There were no projecting ornaments of any kind, the outside of the boxes was flat and even, and the ceiling was perfectly smooth, without any ornamentation in relief, and the form that of a slight dome. The pit tier fitted tight on to the floor. In this short description we have, I think, the whole secret of good sound. Sound expands equally every way, and all bodies attract sound, and sound is absorbed by all soft and dull surfaces within reach. Water has a remarkable way of attracting or conveying sound, and an authentic and curious instance is recorded of its action in a theatre. At the Argentino Theatre in Rome some minor alterations were once made, and the workmen stopped and diverted a stream of water which flowed under the building from the stage through the auditorium. The acoustic properties of the house, which were good before, were ruined, and the stream of water had to be permitted to run again in its old course.

The good seeing of the audience practically limits the size of a theatre; the form is conducive to good hearing, and therefore as long as the direct force of the voice is depended on we cannot get far wrong; the increase of the sound may be safely left to itself, and our attention should be given to prevent reflexion from the voice, to shut out external sounds, and how best to trap off the conversation or sound of one part of the audience so that it shall not disturb the rest. There should be no vacant spaces without the circle, the brick wall ought always to be at the back of the boxes, though, for safety against fire, another may be required across the corridor. If there is a partition at the back of the boxes good hearing can scarcely be expected. It does not appear, however, that openings in the wall round the boxes are detrimental to the sound, for an instance is on record as to the theatre at Lisbon which was considered one of the best in Europe, yet after a short time they found the sound was lost. The cause was discovered to be in consequence of certain passages at the backs of the boxes having been stopped up, and when they were re-opened the sound returned. Let the fronts of the boxes be as simple and free from hangings and curtains as possible. All ornament in relief is fatal to sound; it stops its progress and true course.

M. Garnier, when about to erect the Opera House in Paris, visited most of the theatres of note in Europe, and he found so many different and contradictory acoustic qualities and non-qualities that he came to the conclusion it was impossible to reconcile the numerous theories, that the science was yet in its infancy, and the result uncertain. To this conclusion we may partially assent, but "the science in its

* Civil and Mechanical Engineers' Society. An ordinary meeting was held on Thursday, February 1st, the President, Mr. R. Harkness Twigg, M.I.C.E., in the chair, when Mr. Augustus W. Tanner, A.R.I.B.A., read the following paper.

infancy" I take exception to. Is it not rather we, who from time to time lose sight of the science by reason of our persistent opposition to all its principles? The Greeks knew the principles and built to suit them. We, I think, know them too, but we try to force the principles into our buildings.

At the present time there is great activity in theatre building, and in the alteration of existing theatres, consequent, in great measure, on the recently promulgated regulations of the Metropolitan Board of Works. It would be needless for me to trouble you with any of the clauses contained in the Regulations, or likewise with any of Captain Shaw's excellent suggestions. They have all been published, and no architect would dream of building a theatre without first consulting them before committing his design to paper. These regulations have, however, caused a complete revolution in the construction of theatres. Theatres have become more intensely practical. Common sense and attention to the absolute wants of the place are the main points to bear in view in making a design. If true before, it is doubly true now that a theatre has become a pure piece of practical arrangement which the greater portion of the world never see or care to understand. If it was useless before, it is certainly of no use now, for any one entrusted with the design of a theatre to spend time and money in running all over the Continent to study examples. The artist who is elated with the importance of his commission must descend from flights of fancy to the study of rules and by-laws, to which all his design must be made subservient. Now, before we go on, I must for a moment read what Saunders wrote on this very subject of safety from fire so long ago as 1790, remarks which are excellent, though, I think, never made law:—"Theatres should be surrounded by a thick wall all round the stage and auditorium. Over the curtain an arch may be turned, on which the wall may be continued up quite through the roof so as to prevent all connexion of the timbers. The passages communicating with the boxes should all be arched, and have an easy access to spacious stone staircases that would, in case of fire, enable the audience to depart without the least hazard; and though it is necessary to confine the entrances to few in number, yet there ought to be many large doors hung on the outside ready to be thrown open at the conclusion of the performance, and upon any sudden alarm. Partition walls should be carried quite through the roof in as many places of the building as opportunities afford, and no one would neglect to render it insulated where possible." Had these words been more regarded within the last century, perhaps fires would have been less destructive, though, after our recent experiences, one begins to wonder whether any construction can really be devised to offer effectual resistance to the flames. The elaborate regulations are, after all, but the natural progressive outcome, as it were, of Saunders's remarks.

The great points to bear in mind in planning are,—transfer all operations possible in the working of a theatre to a separate building, fireproof construction throughout, solid division walls between the various parts of the building, convenience of access, an extra exit-door to every entrance and contiguous to it, all doors to open outwards, the exit-doorways to be the greatest width of the whole passage, absence of steps in corridors, use inclined gradients of 1 in 10 in preference, hand-rails 3 in. from walls, no corridor or staircase less than 4 ft. 6 in. wide, an additional 6 in. for every 100 persons to be accommodated, increase the width of corridors when other passages meet them by the width of each added passage, protection of structural ironwork, no workshops either above or below the auditorium, 3 ft. passages at the back of all the circles, separate and distinct entrances and exits from the various parts of the house, a proportional area of 250 square feet for every 100 persons throughout the lobbies, passages, and landings. In parenthesis, I may say one Continental country requires a provision of two exits for 300 persons, and three for 500. Strong wooden barriers in all spacious corridors breaking up a possible crush and separating the people into fifties; strong divisions in all staircases, 6 ft. wide and over. Exposed stone for floors and corridors is a bad material; it should be supported throughout, and bedded on concrete. Fire-bricks, laid in fire-cement, is the best fireproof material for floors and staircases; and when all is built in accordance with the rules, let the manager's fireman be a real fire-brigade servant, not an ornamental appendage only. These regulations thus cursorily gone over should be borne in mind when studying examples of works in progress. A theatre badly built is the worst and most dangerous of all buildings; but, save the expense, there can be no possble difficulty whatever in making it perfectly safe, even with kitchens and smoking-rooms on the premises.

A few days after the Wood-street fire, you may have read a letter in the newspapers as to perforating box-girders and charging them with water. Captain Shaw, in 1876, promulgated this idea, for he describes how perforated pipes could be fixed in his work on "Fires in Theatres." Mr. Boucicault, in 1867, in writing a letter to the *Builder*, advocated the use of a system of pierced pipes on the under-side of the joists in the gridiron floor, such pipes to be attached to the constant main of the water service. The idea is not a new one, but when duly worked out and applied to the building, the water might fall at the wrong time and place without touching the fire, or a large amount of uncalled for damage might be caused by the apparatus being used on a false alarm. When Drury Lane was burned down, in 1809, there were, in the upper part of the house, two immense reservoirs, of capacity sufficient to inundate the house; whether they were empty, forgotten, or were not to be reached, they failed in their purpose. A large iron curtain had also been set up between the auditorium and the stage. A few months previously to the fire it was found to be too rusty for use, and was removed. The huge tank in the roof of her Majesty's Opera House in the Haymarket remained *in situ*, and was a conspicuous object long after the destruction of this building by fire on December 6th, 1867. The watchmen on the spot declared they attempted to use the supply of water to quench the fire at the first outbreak. The cause of this fire was never known; some said it was due to the over-heating of a flue. The *Builder* suggests it might have been caused by a spark which smouldered and spread till heat was generated sufficient to produce flame, for the last incident that took place on the stage was the descent of *Don Giovanni*, amidst fire and smoke, to regions below. The wood lining throughout the house caused its rapid destruction; it burned fiercely, and was destroyed within an hour. The staircases were also of wood. Professor Roger Smith, writing after the fire, says, "That all the interior faces of the building,—those against which the vibrating mass of air impinged,—were of resonant material, *i.e.*, of dry wood, in as long lengths as possible, and fixed at as few points as possible, and to this construction were mainly due the very remarkable acoustic qualities. Nor is there, so far as I am aware," the Professor adds, "any possibility of securing this advantage with incombustible materials."

Fergusson makes some excellent remarks on the ideal form for an auditorium of a theatre. As to the horizontal section or plan; each tier in the centre is kept perpendicularly over the one below, and each tier of side boxes or stalls is thrown back towards the wings till the uppermost tier becomes a semicircle. The whole audience sit more directly facing the stage, and the volume of sound becomes considerably increased throughout the whole house by its freer expansion immediately on leaving the stage. I know this plan is scarcely likely ever to be carried out on account of the valuable space lost to the management in the angular-shaped compartments on either side next to the proscenium wall. Still, I give it as the idea to be aimed at. In determining the longitudinal section, the inclination usually given to the stage is ½ in. to every foot. The drop from the front of the stage to the floor of the orchestra is 4 ft. 6 in. Produce the inclination of the stage to about the back of the pit, and the slope of the pit floor is a line from that point to the floor of the orchestra. This method, like all rules, must be modified to suit the wants of each individual plan. The slope of the upper tiers is obtained by a line drawn from the same point, touching the edge of each step in the floors of the several circles and gallery.

We now come to the description of a theatre in course of construction and rapidly advancing towards completion, and for this I am indebted to the great courtesy and kindness of the architect, Mr. Thomas Verity. The Pandora Theatre, in Leicester-square, built on the site of Savile House, will prove to be one of the most remarkable spectacular theatres built in our own day. It is designed for the service of music, for the ballet, and for scenic effects. It presents many interesting and entirely novel points of construction. The whole design and plan of this building are bold and grand from its great and imposing dimensions. The auditorium is arranged to seat 3,000 persons, besides a large space for promenade. The entrances and exits are admirably planned for comfort and safety. Besides the ample and commodious approach from Leicester-square there are fireproof extra entrances and corridors on the level of Lisle-street, and giving access from that thoroughfare. Spacious stone staircases communicate with these corridors from every tier. The auditorium measures 60 ft. from the proscenium curtain to the front of the grand tier boxes, and is 60 ft. in height from the stall-floor to the ceiling, and contains three tiers above the stalls. The greatest transverse diameter is 58 ft. between the fronts of the boxes on the first tier circle. There is a dress-circle or balcony projecting, however, in front of the boxes, and the clear dimension between the fronts of this circle is 50 ft. This balcony is constructed after the Parisian fashion, without the objectionable columns for support being fixed on the outer edge of the same. A similar plan was adopted in the New Opera-house in the Haymarket. The columns are here (in the Pandora) successfully placed as many as five rows back on the plan. The greatest projection of the cantilever girders supporting the circles is 12 ft. 4½ in., in the centre of the auditorium, from the columns or fulcrums, gradually lessening round the sides to a projection of 4 ft. 2 in. from the columns next the proscenium wall. These wrought-iron cantilever girders carried by the cast-iron columns are of the most studied and unique design. You will see, by referring to the working drawings of these girders, that the cantilever principle is here carried to the greatest perfection. Every piece of iron, I have been assured by Mr. Ordish, who designed them under Mr. Verity's direction, has been calculated to the greatest and most exact nicety. The plates are ½ in. thick. Over the columns where lies the greatest strain, the strength is added in the most scientific way. L-irons, 6 in. square, are bolted upright in pairs on either side of the plates, packing-pieces are carefully introduced next the cap and base of the columns respectively, and cast-iron blocks are bolted through the L-irons at intervals; the transverse girders going round the circles meet here, and the upright portion of the cantilever between the base of the cast-iron column above and the cap below, becomes a continuous portion of the columns. The columns or fulcrums for these noble cantilever girders are placed on plan about 13 ft. from the surrounding wall of the building, bringing the total width of the auditorium up to the grand dimension of 86 ft. To the transverse girders above mentioned are bolted at average intervals of about 6 ft. lighter rolled-iron joists, radiating towards the centre of the house. Between the columns and the wall the floors of all the tiers throughout are constructed of Messrs. Dennett's patent fire-resisting concrete. There are no hollow spaces between ceiling and floor. The floor is finished for the most part with the same material to a fine surface. The absence of any space for heated air to accumulate, should fire unfortunately occur, renders these floors completely fireproof, in every sense of the word. Rings of wrought-iron extend from point to point round every circle at the extremities of the cantilevers. The projecting portions beyond the columns are not constructed throughout of fireproof materials. The half-inch scale section throughout all the tiers shows the columns above columns and the cantilever girders running through. On the gallery level you will observe that the columns from that floor to the roof project over the columns below a distance of 3 ft. 6 in., and are supported by the girders which run from the wall over the lower columns. The upper columns are principally for decorative purposes, and are to be covered with Jackson's canvas plaster, a fire-resisting material of excellent quality which has stood the test now of thirty years' use. These upper columns also impart a certain amount of rigidity to the whole structure from floor to ceiling. There are many special cases in this wonderful iron structure which had to be met by special arrangements, as for instance the varying rake of the slope of the stepped gallery, in some cases the raking girders run

from the top of the wall or just under feet of trusses to the foot of gallery; in others they stop the feet of the trusses, and so transfer the weight of the latter to the wall. All these interesting points in detail could be far better described by the engineer who designed them. The whole of this work is now fixed complete, and there it stands as tight as a drum, and perfect in every respect. Under the iron roof, which is covered with boarding and zinc, it is proposed to have a velarium similar to that in use at the Royal Albert Hall, the design of the roof of which building Mr. Verity had a great deal to do with. This will no doubt give an exceedingly handsome effect, and prove very beneficial to the acoustic properties of the house. These acoustic properties have been thoroughly considered throughout all the arrangements. The walls at the backs of the circles and boxes will be lined all round with match-boarding. The whole of the woodwork throughout the building will be thoroughly saturated with Astrop's cyanite, a new material rendering the wood to a certain degree impervious to the effect of fire, inasmuch as, though it may be consumed, the wood will not support combustion. One wash of this material suffices, and it supersedes the use of asbestos, which requires four or five coats to prove effective, and then, if exposed to a sharp blow, is liable to flake off and leave the wood exposed. The canvas and cloths, too, when not painted in distemper, will also be saturated with Astrop's cyanite, for it is equally applicable to such substances. The auditorium is four floors in height,—the pit and stalls on the floor, the balcony tier, the dress-circle tier and promenade, and the gallery tier. The promenade at the back of the dress circle above the balcony is of a uniform width of 14 ft. The whole of the ceilings, box-fronts, and decorations in the auditorium will be executed in Messrs. Jackson's patent canvas plaster. The width of the stage opening is 33 ft., and the height 35 ft. The depth of the stage is 54 ft. The curtain at Drury Lane is 32 ft. wide, and the depth of stage 48 ft. I believe the largest cloths in England are at Covent Garden,—there they measure 70 ft. by 50 ft.

At the Pandora there is great width on the stage behind the proscenium wall, a point of considerable importance in planning the stage. The stage does not project into the house, this form as well as the stage-boxes being now inadmissible. The balcony tier slopes from the centre on either side towards the proscenium, following nearly the same line as the floor of the pit; the total inclination measures about 2 ft. 2 in. At the Alexandra Theatre, Liverpool, Ed. Salomons, architect, the inclination is 1 ft. 9 in. The greatest inclination known is that adopted in St. Petersburg, where the fall is equal to the depth of the box fronts. The planning of this magnificent theatre (Pandora) presents many points of the greatest interest, the way in which the circles gradually recede over one another and round towards the wings will be conducive to the attainment of a good view of the stage by the whole of the audience, and this feature will also add in appearance to the size of the house. It may be regarded as a grand architectural effort in the right direction, making the building more fitted for its purpose than any before erected, and entirely opposed to the well-known received classical examples. The magnitude of the works necessary in carrying out the foundations, and what I may term the first structural parts of the building, were enormous, and would take too long to describe fully here. The excavation below the stage is 40 ft. below the level of Lisle-street; the floor of the stage is 20 ft. below, and taking advantage of the rise in the ground from south to north, the first circle is on a level with Lisle-street. The whole centre part of the structure above the stage is supported on four very heavy cast-iron stanchions three stages in height, the metal at the thinnest section being 1¼ in. thick. These form a square on the level of the gridiron floor, measuring 50 ft. from north to south and 37 ft. 6 in. from east to west. Solid brick piers have been built around them. The total height from the foundations is 50 ft. On either side these stanchions support two enormous wrought-iron single-web girders, each spanning 50 ft., 52 ft. long, and 6 ft. high, weighing over 15 tons each,—stronger than any railway girders of like span; and at the end next the auditorium is a monster girder, about 4 ft. deep and weighing 7 tons, supported in like manner by the stanchions. These girders carry the whole weight of the scenery battens, borders, flies, and all appurtenances, as well as the wrought-iron roof trusses and roof over the centre of the stage, to the ties of which are fixed the gridiron floor. The side girders support also the wall of the ballet-room on the east, and the wall of the rooms for the "supers" on the west side of the stage, and their share of the weights of the floors and roofs to these rooms. These rooms are on the same level as the gridiron floor. The weight of the scenery is computed at 2 cwt. per foot super. over the whole space of the stage. This is a weight which has sometimes not been realised fully in previous constructions over stages, and important theatres have repeatedly had the upper supports of the stage strengthened after completion, at great expense, in consequence of oversight in this respect. An immense timber staging 50 ft. from the ground was constructed, and these huge girders were all taken up in single plates and angle irons with the rivet-holes prepared. On this stage they were then riveted and manufactured. The wrought-iron roof trusses were hoisted up in lengths and the junctions made on the timber staging. Messrs. Dennett & Ingle were the contractors for this work, perhaps the largest and heaviest piece of constructive ironwork before placed in any one building in London. The whole was supplied, manufactured, and fixed,—the large and deep plates and shaped webs for cantilevers having to be specially rolled,—within four months of the date of order. It is purposed to light the auditorium of this theatre by a combination of the Lane-Fox incandescent electric lights, each surrounded by a ring of small gas jets in glass lanterns of special design.

Having now brought before you a notice of one of the large theatres in course of construction where ironwork has been extensively used, let us look at the matter from another point of view altogether. One of our greatest theatrical architects, Mr. Charles John Phipps, has very kindly favoured me with an epitome of some of the more prominent practical methods which he adopts in the scheme of a theatre. And let me at once preface these remarks by saying that I think Mr. Phipps's plans of construction exceedingly sound, good, and simple. They are consistently followed out by him as he has explained to me, and used as they are by one so high in authority and of such vast experience in the theatrical branch of the profession, they merit our most careful study. Mr. Phipps, as you are aware, was one of the important witnesses before the Select Committee on Metropolitan Fire Brigade in 1877.

Now Mr. Phipps lays it down as a principle to be aimed at in the planning of a theatre that no constructive ironwork and no stone staircases should be used. This principle is carried out almost entirely in the Savoy, and others of his works. In the Savoy the only iron used are light iron columns to support the circles: these columns are set back considerably from the fronts, and there are iron stanchions in the division-wall at the back of the circle; these are entirely protected by fire-resisting material. The floors and staircases throughout are constructed of concrete made of one part Portland cement and four or five parts broken and ground bricks, with a finished surface of the same material, or floated in cement. The division-walls at the back of the circles, and the walls of the passages, which extend all round the circles, are built of the same material. It should be remembered that a material to be fire-resisting should be made entirely of substances which have already been subject to the action of fire and heat in their preparation. Tiles and fire-bricks may be used for floors and stairs. The Dennett concrete,—the matrix for which is formed by a special preparation of gypsum, the remainder of the composition being mainly of broken brick, is unchanged by the action of fire. Mr. Phipps was one of the earliest to adopt the erection of a solid brick-wall from cellar to roof, and 3 ft. above the latter, between the auditorium and the stage. Eighteen years ago in the Nottingham Theatre he built the first solid proscenium wall in the country. Instead of an iron girder to bridge the proscenium opening he advocates the use of a wooden beam as large as can be got. This beam has a bearing of several feet on the piers; over the beam is turned an arch of four, five, or six rings, as required; skewbacks are cut in the beam to receive each ring, a strong stone template is bedded over the centre of the arch, a wrought-iron rod bolted through this stone and the beam, and the spandrel then filled in with brickwork. The beam is covered with an inch of good plastering, and it is certain that no fire, however fierce, would destroy this timber, for before it could possibly be burned through, or even calcined more than an inch, the fire would have exhausted itself. This construction he habitually uses, and it was followed out in the alterations at Drury Lane, where the span of opening is 36 ft. and the beam 1 ft. 8 in. square, and where, I may add, the wall, some 80 ft. high, between the stage and auditorium, was built without stopping the performances a single night, the men working only till five o'clock daily. Mr. Phipps successfully advocated the use of concrete dividing doors between the several risks of the building in place of iron. These doors are light and work excellently; they can be made no more than 1½-in. thick. Concrete as a fire-resisting material for windows and doors has, by the way, never yet received its proper share of attention. It can be made and moulded by Mr. Lascelles, Messrs. Dennett, and others, as fine and delicate as woodwork, and is really as fireproof as the coarser material used in floors. The word risks is used in an insurance sense, and it is extremely important in designing a theatre to divide it into several risks. Besides the proscenium wall, which alone will materially lessen the expense of insurance, the dressing-rooms should be separated from other parts of the house by solid walls and concrete doors, and the corridors, entrances, and saloons may be made to form another risk.

As to metal curtains for the proscenium opening and special reservoirs, all our theatre builders agree in thinking these things of little real service. I have previously shown how small in actual practice is their value when the crisis comes; but if a curtain must be provided, then it should be worked down from the prompt-box, not from the flies, and the same position should be adopted for the working of any special appliances; for in a panic or real alarm few men would have the courage to ascend aloft. In Paris, the adoption of a metal curtain between the stage and auditorium is enforced by the rules dated April 12th, 1877. It is not in special appliances the safety of the public is secured, but in generally sound construction. Instead of iron columns, wooden pillars should be used, even if required for the support of staircases, as well as under the stage-floor, where their advantage is obvious, from the movable nature of all matters connected with the stage. The constructive ironwork used in the Gaiety Theatre is entirely enclosed with fire-resisting concrete; in the Princess's and Sadler's Wells, as well as at the Savoy, there is practically none. I have heard the latter theatre highly praised by persons of position for its excellent planning and lighting. The Savoy was the first theatre where the electric light was used, and it is lighted throughout by means of Incandescent Swan lights, 1,200 in number, the clear-glass lights being enclosed in ground glass globes, which soften and diffuse the light. Bruce's theatre, when complete, Mr. Phipps purposes lighting in a similar manner. The lighting by gas from above a glass ceiling, at the Théâtre Lyrique and the Théâtre de Châtelet, at Paris (opened about the year 1861), had to be abandoned, on account of the immense additional quantity of gas consumed by such method. The radiation of the circles and their inclination towards the stage is admirably arranged in the Savoy, and the acoustic properties of the house are excellent. The auditorium is lined with wood, and the floors of the balconies and gallery are of wood. The use of solid wood-block floors for these parts of the house would certainly ruin the sound, and as there are substances to cover or saturate wood with, to prevent its supporting combustion, no increase in danger need now be apprehended from its limited use. Of the reconstructed Haymarket Theatre,—one of Mr. Phipps's most successful works,—I need say nothing, as it is well known to us all.

I have purposely avoided any description of the German summer and winter auditorium, or of the recent American theatre, known as Madison's, with its movable stage, the principle of which may be briefly explained as consisting of two separate and distinct stages, one visible to the audience, one below that of exactly similar dimensions, and a void space above of the same size as the visible stage, so that while the acting of one scene in the visible stage is going on, the

scene-shifters are preparing the stage below for the next act; the whole affair then rises, bringing the lower stage into position; and for the following scene the shifting is done above, and the apparatus then falls. It is, I think, in this theatre also where an orchestra-box is erected above the curtain, the utility of which I fail to unfathom. All these innovations may be dismissed as not very likely to be introduced into this country; and to conclude, as to the best form for an auditorium, I lean to a development of that followed out in the Théâtre Historique and the Théâtre Lyrique at Paris, *i.e.*, an ellipse with its major axis at right angles to that of the stage. By this disposition the whole of the audience are brought nearer the stage, and they all more equally get a good view. As to sound, this form is excellent, as the Théâtre Lyrique is said to be one of the best for hearing. The inclination of the pit-floor and circles would be less, their receding would not be so marked, a tier in height would probably have to be abandoned owing to the comparative nearness of the circles to the proscenium; but an equal number of persons would be accommodated, as a much greater depth of circles from fronts to backs would be used in practice. The construction would present no difficulties, and the exits and entrances would be equally available to any portion of the house as in those buildings where the plan is a circle or an ellipse with its longer axis co-incident with that of the stage. I would have the boxes as few in number as possible, and confined to a small space in the auditorium. The pit-goers I would accommodate in the upper parts of the house, and devote the floor to the stalls, the first circle round the same being slightly raised above the last row of stalls, and the circles constructed on cantilevers without columns. Such a house would have a light and agreeable appearance, and I think would successfully meet the requirements of the present day.

In the discussion which followed, Mr. John Hebb, of the Metropolitan Board of Works, further enlarged upon the regulations of the Board, and wished that we could follow the example of other countries in having theatres erected on free and open sites. As to the metal proscenium curtain in Paris, Mr. Hebb remarked that he had inquired into the matter, and found that, owing to the authorities not being able to make up their mind as to the best form of curtain, the Parisian rules on that point had never been enforced, and were a dead letter.

Mr. Max Clarke made several technical remarks and inquiries as to the iron construction of the Pandora Theatre, with which he did not altogether approve. He strongly advocated the use of a wooden beam over the proscenium, opening as Mr. Tanner had explained in a diagram. Mr. Clarke then invited the opinion of the meeting as to a novel roof for a theatre he would propose, consisting of iron trusses to support the outer covering, with iron suspension rods from the trusses carrying a concrete ceiling of domical form. He advocated the use of a fireproof curtain between the stage and auditorium, provided a satisfactory one could be devised.

Mr. F. Ingle confirmed Mr. Tanner's remarks as to the iron construction of the theatres he described.

Mr. Wm. C. Street, in proposing a vote of thanks to the writer of the paper, added some valuable remarks on the acoustic properties of buildings.

Other speakers followed, one of whom spoke strongly in favour of asbestos being the most desirable covering for protecting wood from the effects of fire.

Skelton-in-Cleveland. — The handsome church now in course of erection at Skelton, near Saltburn-by-the-Sea, Yorkshire, from the designs of Messrs. Austin & Johnson, of Newcastle, and which is about completed, with the exception of the interior fittings, is to be further improved by the addition of a substantial tower, upwards of 80 ft. high, which will form a conspicuous object on the hill-side behind that well-known summer holiday resort. The cost of the tower, which approaches 3,000*l.*, will be defrayed by Mr. J. T. Wharton, of Skelton Castle, and the church fittings, which will cost upwards of 1,000*l.*, are to be provided by subscription. The chancel will be furnished with wainscot oak seats and panelling, and the rest of the church with pitch pine. The contractor for these additional works is Mr. F. Caldcleugh, of Durham, who has also built the church.

ARCHITECTURAL ASSOCIATION.

AT the ordinary fortnightly meeting of this Association, held on the 2nd inst., Mr. E. G. Hayes, president, in the chair, a vote of thanks was accorded to Mr. E. J. May, for allowing the members to visit the house just erected from his designs in Bedford Park, Chiswick (and which we described in our last, p. 139). It was announced that the next visit would take place this (Saturday) afternoon, to the new Oratory at Brompton.

Mr. H. W. Brewer then read his paper on "The Position of the Choir and Organs in Churches," which we print in another part of this number (see p. 168, *ante*).

Mr. H. H. Statham, who had been invited to take part in the discussion, wrote to say that he was prevented by another engagement from being present, but he sent the following remarks on the subject, which were read by Mr. Eales, one of the honorary secretaries:—In regard to cathedrals, I think the formerly usual position of the organ, on the screen between the nave and choir, was the best both for architectural effect and for the effect of the instrument, as long as the organ was of moderate size, and as long as the choir was practically the church, or when the choir and nave were not used simultaneously for worship. I do not think that position of the organ was at all detrimental to architectural effect,—rather the contrary. There is now, however, a growing feeling in favour of uniting the choir and nave, or having only a light open screen between, which necessitates the removal of the organ from that position; and the greatly-increased size of modern organs would render it impossible to plant the whole of the organ on the choir-screen in any case. Under these circumstances, I think a cathedral organ is best placed with the lighter portion bracketed out from one wall of the choir, and the heavier portion placed in the choir aisles, behind a screen; but the pipes must be concentrated, not scattered about as if they were playing at hide and seek in the choir aisles, as they are in one cathedral I could name; that takes away all the unity of effect of the instrument. The organ itself would sound better all built up in one case in the transept, but that is too far from the choir to blend with them or keep them properly in tune. The best of all arrangements for a cathedral, would be a small organ in the choir to accompany the choristers, and a large nave organ, either at one side or at the west end, to lead congregational singing: and with the present means of electric action the two could be brought under the control of the same player. For parish churches, I think there is no question that the best position for the choir in reference to the congregation, is the usual one, standing sideways and divided for antiphonal singing. The old west-end position of the choir placed them *behind* the congregation whom they were to lead, which was unsuitable; and to place them facing the congregation at the east end, though the best position musically, would be at variance with the idea of the simultaneous worship by choir and congregation, as well as placing them with their backs to the officiating priest. That being taken as settled, there is at present no place for the organ except in the chancel aisle or organ-chamber, which, as generally constructed, is simply fatal to the effect of the organ. The organ *must* be near the singers, however, and the bad effect of the organ-chamber may be lessened by making it much higher than is usually done, and by sinking the floor so as to get the bellows and the lower part of the pedal pipes below the floor, and the wind-chest on a level with the floor. The pipes will then have more space over them, and the sound will develop and get away better. In the usual low organ-chamber, we generally hear a great noise close to the organ, a large proportion of which does not get into the church at all. I consider, however, that all the difficulty arises from the faulty plan of our churches, and that reform should begin here. The adoption of the long chancel in which the choir are placed, is not only unpractical, as being the worst possible for the effect of the choir, but is, even from the point of view of orthodox precedent, without any reason for its existence. The long choir came into use in the latter days of the Mediæval church, when the clerical body and their subordinate functionaries became very numerous, and required the lengthened choir to accommodate them all. They chanted the service, but they were shut off within a choir and behind a screen, *not* as choristers, but as *clergy*. In the present day there is no such large body of clergy connected with any church; the choir, whether paid or amateur, is a lay choir, and is properly part of the congregation, whose service of praise it is supposed to lead. But the choristers, who are no longer clergy, are packed into a long narrow chancel where they cannot be properly heard, necessitating also a most ineffective position for the organ, merely because such a position was once considered correct at a time when the clergy were themselves the choir. I cannot see that, even on the most orthodox High Church view of the matter, there is any reason for this arrangement. Let church builders return to the basilica plan, which was for centuries the accepted church plan, and which is exactly suited for our modern service,—the plan with the short chancel for the clergy and the altar, and the nave for the congregation; let them place the choir in the front portion of the nave (only seated sideways), forming, as they should, part of the congregation, and place the organ in a shallow transept adjoining them, and we should hear no more about the difficulties of placing the organ, &c. The whole difficulty arises from retaining, for a lay choir, on a mistaken idea of precedent, a form of plan intended originally to accommodate a numerous clerical body, which no longer exists.

The Chairman said the meeting had listened with very great interest to Mr. Brewer's interesting paper, and also to the supplementary remarks which Mr. Statham had been kind enough to send, and which appeared to throw some new light upon the subject. The whole question, it seemed to him (the Chairman) was to a large extent one of sentiment and ritual. Of course, looked at from an organist's point of view, the position for the instrument indicated by Mr. Brewer in his drawing was probably the best that could be chosen, although he had awarded very high praise to the position of the organ at Ratisbon, in the apse, at the rear of the altar. In the construction of an organ-chamber the object to be sought, he (the Chairman) took it, was to get as much height as possible, and to get the walls to act as sounding-boards, and probably curved surfaces would be the best. He understood Mr. Brewer to say that the plan of dividing an organ into two was objectionable, but in that they would probably not be all agreed. Did Mr. Brewer consider the arrangement of the organ at All Saints', Margaret-street, a bad one? However they might differ from him, however, they would all thank him for his paper, accompanied as it was by so many excellent and interesting drawings, for they were always glad to see his clever handiwork.

Mr. J. A. Gotch, in moving a vote of thanks to Mr. Brewer, observed that, fascinating as was Mr. Brewer's drawing showing his suggestion for the position of an organ, he should be very sorry to see all our cathedrals with the organ over the rood-screen or choir-screen. It seemed to him that one of the great effects of a grand cathedral, and one that stirred the beholder with so much awe, was the vista from west to east of the whole length of the interior. To cut the interior in half and so destroy the vista by placing the organ as suggested by Mr. Brewer would be a very great pity. But of course it was a matter of taste. No doubt the organist regarded the organ as one of the finest objects in creation, and would not have the least objection to its interference with the vista. But speaking for himself as an architect, he would rather see the whole length of the church than the finest organ that could be placed in it. It appeared to him that the west end of a church as the position for the organ had the sanction of antiquity, and was in all respects a very excellent place for the instrument, but the question was one for musical experts to decide. From an æsthetic point of view, he desired to raise his voice against obtruding the organ right into the middle of the church. He quite agreed with what had been said as to the improper positions often selected for organs. He knew a little church in Northamptonshire the chancel of which had been rebuilt as the mausoleum of a neighbouring ducal family, but quite recently there had been clapped right into the middle of it an organ, which had no merit whatever so far as the case was concerned.

Mr. W. A. Pite, in seconding the motion (in which he included the name of Mr. Statham), said he could bear testimony to what Mr.

Brewer had said of the organ in the Cathedral of Ratisbon, where the music and singing were simply superb. With regard to the position for the organ suggested by Mr. Brewer in his drawing, it was to be doubted whether the clergy in the chancel would be able to make themselves heard in the nave, owing to the obstruction which would be afforded by the organ and screen to the passage of sound. There was an organ in Westminster Abbey in the tenth century, and there seemed to have been one at Winchester, erected by Bishop Elfeg, in 951, and which Wolstan, one of the monks, thus describes;—

> Twelve pairs of bellows ranged in stately row
> Are join'd above, and fourteen more below;
> These the full force of seventy men require,
> Who ceaseless toil and plenteously perspire,
> Each aiding each, till all the wind be prest
> In the close confines of the incumbent chest,
> On which four hundred pipes in order rise
> To bellow forth that blast the chest supplies.

Mr. F. Farrow, in supporting the motion, said that with regard to the position of the organ, every one who was acquainted with the needs of the instrument would agree that it should not be placed where it could not make itself properly heard. One instance in which an organ was placed in a transept occurred in a modern church at Armley, near Leeds. There the organ was a very fine instrument, and the wind was supplied by a hydraulic blowing apparatus located in a building outside. In Glasgow Cathedral it was a condition of the authorities that the organ should not be a prominent feature, and hence it was necessary that some of the pipes should be laid horizontally in the triforium. The effect, musically, was very good. Although, no doubt, the western gallery of a church was a very good position for an organ, the clergy were not likely to adopt such a position, owing to the difficulty of maintaining discipline amongst the choristers, who must, of necessity, be located near the instrument. It had been suggested that a large organ might be placed at the west end of a church, and a small one in the choir, but it was not easy to get them both to act together, and even if that could always be done, the sounds of both instruments could not possibly reach the ears of all the worshippers at precisely the same time, and the effect of this would often be unsatisfactory. Probably the best position for a church organ was that suggested by Mr. Statham, viz., a shallow transept, so that the instrument would be in a comparatively open situation, and close to the choir, without obstructing the view of the altar. An organ so placed would render it possible for the organist to bring out its full effect.

Mr. Hampden W. Pratt said that as architects they were more concerned with the question as to the best position for an organ in a church than with the question as to the best place for a cathedral organ. An arrangement which might be suitable for a cathedral would not necessarily be appropriate in a parish church. Assuming that Mr. Brewer's remarks applied rather to the needs of the Established Church than to Nonconformist churches (in which there was no difficulty in arranging the congregational singing with reference to the organ), it occurred to him (the speaker) that if the chancel were made rather wider than was usual, the organ might be placed on one side of it without projecting to such an extent as to obstruct the view of the altar. Of course if that were done it would be necessary to give the instrument a more ornamental and architecturally-effective case than was at present the rule,—a plan which would be productive of much better results than merely decorating the pipes, for most people were rather tired of seeing organs with gaudily-decorated pipes inclosed in cases of no architectural character. While he quite agreed, however, with Mr. Brewer's contention that organs should be more prominently placed, he was sorry to hear from him that the tendency was for organs to become larger and larger. If they became much larger than they were at present, how were architects to properly dispose them? Their difficulties in that respect were already sufficiently great. For his own part, he was of opinion that a great deal more money was, as a rule, spent upon organs than was necessary or justifiable, having regard to the other requirements of buildings intended for religious use. Some objection had been made in the course of the discussion to the position for an organ suggested by Mr. Brewer's drawing, but he presumed that the suggestion was only applicable to cathedral organs?

Mr. Brewer.—No, it applies to parish churches. The drawing is meant to represent the interior of a parish church 130 ft. long.

Mr. Pratt said that being the case he should object most strongly to the placing of the organ in so prominent a position, for to place it as suggested would be to almost make a god of it, an object of worship. Some of the speakers had spoken in derogation of congregational singing, but so long as that continued to form a part of public worship, architects must give due consideration to it in arranging the position of the organ. He agreed with all that had been said in condemnation of what was called the "organ-chamber," which should be abolished, and the organ placed either, as Mr. Statham suggested, in a shallow transept, or, better still, in his (the speaker's) opinion, in the chancel, which might, perhaps, advantageously be made the same width as the nave.

The motion having been put to the meeting, and carried by acclamation,—

Mr. Brewer thanked the meeting for the attention which had been given to his paper, and proceeded to reply to some of the remarks made in the course of the discussion. He observed, with regard to the scheme which had been criticised by most of the speakers, that he had simply worked it out because it had been suggested to him whether it would not be possible to place a church-organ in such a central position. He had, he thought, shown how it might be so placed with the minimum of obstruction. He was not prepared to say that, architecturally, it was the best position, but undoubtedly, from a musical point of view, it would be a good position for the instrument. He quite agreed with the observations contained in Mr. Statham's communication, except with regard to a small transept being the best position for an organ. A large organ very often occupied a space measuring 20 ft. by 20 ft., and 40 ft. high, and those dimensions would necessitate a large and lofty transept. The organ should never touch the outer or side walls, but a space should be left all round it, because, if completely enclosed on three sides, the only pipes which had a chance of properly speaking out were those on the unenclosed side, the pipes at the back being half stifled and unable to make their voices properly heard. It had been suggested that the organ, if placed upon the choir-screen, would prevent the voices of the clergy in the chancel being heard by the congregation in the nave. Well, upon that point he would only say that, extraordinary as it might appear, he never knew what the music in Westminster Abbey was really like until he happened one day to be shut in the nave while the service was going on. He had often previously noticed when in the transepts or choir that the music seemed to have a sort of muddled effect, but in the nave on the occasion referred to he could hear distinctly every word that the clergyman intoned. That seemed to prove that the placing of the organ upon the screen would not prevent the voices of the clergy in the chancel from being heard in the nave of a parish church. As to the interference with the vista, he admitted that there was something very fine in the vista along the whole length of a large church, but Mediæval architects certainly did not make the vista the paramount consideration in their interiors, otherwise why did we always find that they provided screens in their churches and cathedrals,—sometimes, as at Durham, extending right up to the roof? In most Continental churches which had not been modernised it was impossible to see entirely from one end to the other of the interior; indeed, it seemed to have been rather the intention of the Mediæval architects to divide their churches. With regard to the practice of dividing organs, he regarded it as objectionable and unwise. In the first place it added enormously to the expense, and in the second place the two parts had to be connected by what were called trackers passing beneath the floor of the church,—an arrangement which was very inconvenient, for if what was known as "cyphering" took place the floor would have to be taken up to get at the trackers. Another objection was that when an organ was divided, the two parts would in all probability be subject to different sets of draughts and atmospheric influences, and thus one part would get out of order a great deal sooner than the other. With such an arrangement, too, the action was a great deal heavier, except where the new pneumatic action was in use, but this appliance, although very ingenious, was likely to get seriously out of order when the atmosphere was damp, and the result would be that the organ would "cypher" like a Board school boy. The "pneumatic action" did very well for important organs in public buildings which could be perpetually attended to, but it was too liable to get out of order for the general run of church organs.

COMPETITIONS.

Frome Sewerage.—In November last the Frome Local Board advertised for reports and plans for the sewerage and sewage disposal of their district, and offered premiums for those which, in their opinion, were first and second in order of merit. Twelve schemes were submitted, and these have been under the consideration of a committee of the whole Board during the past month, with the result that the first prize of 20*l.* was unanimously awarded to the scheme submitted under the motto, "*Palmam qui meruit ferat*," the second prize, of 10*l.*, being given to "*Presto.*" The first prize also entitles the author to be appointed engineer in the execution of the works. At the meeting of the Board, held on Friday, the 2nd inst., the envelopes containing the names of the successful competitors were opened, when it was found that the first prize had been obtained by Mr. Henry Tomlison, Mem.Inst.C.E., of Cambridge and Westminster; and the second prize by Messrs. Dudley & De Salis, of Westminster. The envelopes containing the names of the unsuccessful competitors were not opened. The Board also decided to take steps to carry out the scheme adopted at their next meeting.

"*Gohebydd*" *Memorial Chapel.*—We understand that the committee have adopted the designs prepared by Mr. St. John H. Hancock, architect, for the chapel proposed to be erected at Barrett's Grove, Stoke Newington, as a memorial to the late distinguished Welsh newspaper "Correspondent" (which is the English for the *nom de plume* he adopted), Mr. J. Griffiths. Mr. Samuel Morley, M.P., has subscribed 200*l.* towards the fund now being raised for this purpose.

THE NATIONAL ASSOCIATION OF MASTER BUILDERS OF GREAT BRITAIN.

THE fifth annual meeting of this Association was held on Tuesday, the 30th ult., at Liverpool. The report and balance-sheet were read by the secretary.

The president, Mr. Stanley G. Bird, in moving the adoption of the report, said it might be thought that it was a very meagre one to present, but it contained several matters of the highest importance to the trade generally throughout the country. Firstly, he had to congratulate the meeting on the amicable relations which existed between employers and employed, which was, no doubt, in a great measure, due to the extraordinary depression in the building trade both in London and the provinces, which was a source of regret to all, and he was sorry to say that the prospects of improvement do not seem very bright. Secondly, he regretted that during the past few months Mr. Potter, by his letters in the *Times*, had tried to stir up an agitation in the trade, and had gone out of his way to make a gratuitous attack on this Association. He (the president) had answered the letters, pointing out that the motto of this Association was "Defence, not Defiance." He was happy to say that the policy of this Association was to try to prevent strikes, and he was glad that up to the present their endeavours had been eminently successful, no great strike and very few small ones having taken place during its existence. Thirdly, the question of deficient and improper quantities was most urgent. Two very important actions had lately been tried at Liverpool, and it was high time that this matter should be taken up, and he again urged on the builders the great necessity for obtaining fair and equitable conditions of contracts. The form agreed to by the Royal Institution of British Architects which had been adopted by the National Association was now in more general use, but not to the extent he could wish. The council recommended the appointment of a sub-committee to go into the whole question of quantities and form of tender, and with a view to obtaining a conference with the Royal Institute of British

Architects at an early date to settle these most important questions.

The adoption of the report was seconded by Mr. Robert Neill, of Manchester, and carried.

The President then drew the attention of the meeting to the working of the Builders' Accident Insurance Company, which was established under the auspices of the National Association, and strongly urged the trade to support the Company, which was established on strictly mutual principles. He quoted one case where the insurer had only paid six guineas premium, and the Company had paid 223*l.* in compensation, as well as the costs of an action.

The meeting proceeded to the election of officers and council. Mr. Stanley G. Bird, of London, was re-elected President, for the third time, with Messrs. R. Neill, jun., and W. H. Cowlin, as Vice-Presidents.

The next half-yearly meeting will be held at Edinburgh.

In the evening the Liverpool Builders' Association entertained the Council of the National Association and a large party of friends at dinner at the Adelphi Hotel, Mr. E. Hughes, the President, in the chair. The toast of success to the National Association was proposed by Mr. Samuel H. Holme, who pointed out the necessity for associations, and that since their establishment the relation between employers and their workmen had been more friendly, and their differences more readily adjusted. The toast of the President of the Liverpool Association was proposed by Mr. Clay, of Manchester.

VARIORUM.

"A HANDBOOK on the Electric Lighting Act, 1882," by Arthur P. Poley, B.A., and Frank Dethridge (Simpkin, Marshall, & Co.), seems likely to be of use to those authorities who are now busily engaged in considering the applications for licences and provisional orders under the Act.——An edition of Spon's "Architects', Builders', and Contractors' Pocket-book of Prices and Memoranda" has been issued for 1883, but we do not find that any additions have been made. It is a very useful little book, brimful of information.——That "Quantities and Measurements: How to calculate and take them," by Alfred Chas. Beaton, has reached a sixth edition is evidence that it is found useful by the classes for whom the author intended it. The list of prices that is given has been revised. The present edition is published by Crosby Lockwood & Co. (London, 1882), and forms part of Weale's Rudimentary Series.——If the various Diaries published for 1883, by T. J. Smith, Son, & Co., Queen-street, Cheapside, especially their Scribbling Diaries, had reached us at the time when others of the kind were before us, they would certainly have had a good word. Even now, indeed, it may not be too late to give it.——"The Garden Oracle for 1883," edited by Mr. Shirley Hibberd, F.R.H.S., contains a body of valuable statistical information on the expectation of life, the relative values of moneys, the fundamentals of land surveying, and all kinds of ground work, and a comprehensive review of every department of the English garden. A special feature is the directory for the purchasers of seeds, plants, flowers, roots, fruits, &c., in which the best sorts for various soils and purposes are set forth.——"Penmanship: a Guide to good Handwriting," by C. H. Mitchell (Pitman, 1882), supplies a want. We wish some of our correspondents would give a little time to the study of it. How thankful our compositors would be!——"The Handbook of the Jones Collection, in the South Kensington Museum," may be had of Messrs. Chapman & Hall, as well as at the Museum. It includes a number of illustrations.

Miscellanea.

The Improved Industrial Dwellings Company has issued its half-yearly report, from which it appears that the company possesses thirty-one estates in various parts of the metropolis, on which 4,029 dwellings have been erected and are in occupation, and 426 are in course of erection, making a total of 4,455 tenements. When these are completed, the number of persons residing in the company's dwellings will be upwards of 20,000.

His Highness the Khedive of Egypt, through the Consul for the Netherlands, has been pleased to confer upon Mr. James Hill, of the Thames-street Lock Depôt, the insignia of the Order of the Mejidieh.

Surveyorship.—Mr. C. J. Dawson, architect and surveyor, of Barking, Essex, has been appointed surveyor to the newly-formed Local Board for that town.

Cost of Silos.—Mr. W. A. Gibbs writes:—I have now obtained three carefully-worked-out estimates for two silos like those of Mr. Mills, and they range from 309*l.* to 500*l.* and 688*l.* These are for the pits only, not for roofs and covers. The first is in soil most favourable for the construction, and where there is ample raw material for the making of concrete; the estimate is by a resident manager, and, therefore, exempt from any contractor's profit. The second estimate is given me by large contractors who have had long experience in similar structures, such as tanks, public baths, wells, and vaults. The third is from a local contractor, and includes carting up gravel for concrete from a distance of four or five miles. I hope these estimates will induce others to state what their silos have cost, or what estimates they have obtained, because this is, beyond all question, a very important part of a very important subject, aad a full comparison of notes thereupon will be of great value.

Arbitration.—Mr. Banister Fletcher and Mr. James Rutherford have been appointed arbitrators in the claims of Messrs. Ventress, against the Promoters of the Stockton Bridge. The amended claim is 22,749*l.* 5s.

Revolving Divisions.—We may add to the account in our paper of the new parcels office at Waterloo Station that the revolving divisions placed therein were executed by Messrs. Salmon Barnes & Co.

TENDERS.

For decorations and repairs at No. 90, Jermyn-street, Piccadilly. Mr. Walter J. Miller, architect:—

Hill & Berridge	£290 0 0
Adams	271 0 0
Spencer & Co.	247 0 0

For alterations at No. 54, Berners-street, for Mr. Oeffellin. No quantities. Mr. E. C. Robins, architect:—

Fairchild	£1,224 0 0
Watson Bros.	1,218 0 0
Cooper	1,198 0 0
Adams	1,109 0 0
Spencer & Co.	1,045 0 0
Ansell	1,045 0 0

For building factory at Chalton-street, Somers Town, for Messrs. Conolly Bros. Messrs. Saville & Son, architects:—

Titmus	£2,333 0 0
Jackson & Todd	2,188 0 0
Kelly & Son	2,149 0 0
Nightingale	2,121 0 0
Spencer & Co.	2,073 0 0
J. Anley	2,070 0 0
Royal	2,065 0 0
Shurmur	2,043 0 0
Beale	1,998 0 0
W. Smith	1,995 0 0
Langmead & Way	1,995 0 0
Lamble	1,977 0 0

For the construction of a new river wall at the Vestry's wharf, Lot's-road, Chelsea. Mr. W. Weaver, C.E., surveyor:—

Mr. Pedrette	£896 18 9
Wilkinson Bros.	895 0 0
Mowlem & Co.	890 0 0
B. Cooke & Co.	880 0 0
Nowell & Robson	865 0 0
John Bell	827 0 0
G. Munday & Sons	748 0 0
W. Hill & Co.	716 0 0
Mr. Rowse	680 10 0
G. H. Thomas*	669 3 10

* Accepted subject to confirmation of Vestry.

For the erection of semi-detached residences in Bensome Manor-road, Thornton Heath, for Mr. A. Stedall. Mr George Edwards, architect. Quantities by Mr. Henry Lovegrove:—

	One pair.	Two pairs.	Four pairs.
Bowyer	£1,910	£3,745	£7,395
Reading	1,845	3,650	7,200
Canning & Mullins	1,855	3,630	7,100
Martin, Wells, & Co.	1,740	3,500	7,000
Stimpson & Co.	1,800	3,570	6,985
Holliday and Greenwood	1,777	3,510	6,93[illegible]
Goad	1,655	3,260	6,350
Smith & Son	1,629	3,207	6,450
Scharien & Williams	1,598	3,152	6,264
Green	1,498	2,985	5,650

For alterations to Nos. 39 and 41, Brompton-road, for Mr. Webb. Mr. George Edwards, architect:—

Reading	£339 0 0
Scharien & Williams	328 0 0
Green	285 0 0
Stimpson & Co.	258 0 0

For alteration, &c., at City Wellington, Fleet-street, for Mr. J. Robinson. Mr. H. Elson, architect:—

Smith	£520 0 0
Anley	496 0 0
Groome	436 0 0
Dearing & Son (accepted)	431 0 0

For making up roadway of Harrington Gardens, South Kensington. Mr. W. Weaver, C.E., surveyor:—

Nicholls	£603 0 0
Rogers & Dickens	580 0 0
Mears	573 0 0
Howell & Robson*	564 0 0
Surveyor's estimate	530 0 0

* Accepted, subject to confirmation of Vestry.

For internal plumbing and hot-water work at new house for Mr. J. F. Wilkin, Beckenham, Kent. Mr. J. Sulman, architect:—

J. Knight, Westminster (accepted).

For erection of Board schools, Hogarth-lane, Chiswick, for the Chiswick School Board. Mr. George Saunders, architect. Quantities by Mr. F. T. W. Miller:—

A. E. Wickham	£6,233 0 0
S. Hunt	5,975 0 0
H. Smith	5,914 0 0
J. J. Bryant	5,690 0 0
T. Nye	5,489 0 0
Adamson & Sons	5,483 0 0
H. J. Whitman	5,420 0 0
Chamberlen Bros.	5,215 0 0
W. Blackburn	5,212 0 0
T. H. Kingerlee	5,190 0 0
W. Oldrey	5,177 0 0
J. Dorey	4,950 0 0
Lucas & Son	4,820 0 0
Priestley & Gurney	4,637 0 0

For pavilion, &c., for the Matlock Bath, Pavilion, and Gardens Company (Limited). Mr. J. Nuttall, architect, Matlock Bridge. Quantities by Mr. F. S. Smith, Manchester and Liverpool:—

		If plate-glass is used.
J. Moores	£6,003 0 0	£6,332 0 0
Brown & Backhouse	6,228 0 0	6,324 0 0
W. H. & H. C. Brown	6,180 0 0	6,299 0 0
Farnworth & Son	6,062 0 0	6,182 15 6½
W. Knowles	5,882 0 0	5,992 0 7
E. Gabbutt	5,806 0 0	5,916 0 0
W. Statham	5,618 0 0	5,748 0 0
Bissett & Son	5,450 0 0	5,570 0 0
W. B. Askew	5,358 18 4	4,474 15 4
T. & W. Meadows	5,340 0 0	5,456 0 0
A. Bridge	5,330 0 0	5,446 0 0
T. Haughton	5,107 0 0	5,239 0 0
Shadwick & Co., Rotherham (accepted)	5,125 0 0	5,228 0 0

For pair of villas for Mr. E. Slack. Mr. J. Nuttall, architect, Matlock Bridge. Quantities by Mr. F. S. Smith, Manchester and Liverpool:—

S. Fox	£1,110 0 0
L. T. Wildgoose	1,094 0 0
W. B. Askew (accepted) Matlock	1,070 0 0

For rebuilding The Falcon Tavern, and two shops adjoining, for Mr. Tavener. Mr. H. I. Newton, architect, No. 27, Great George-street, Westminster. Quantities supplied:—

Burman & Sons	£7,999 0 0
Allard	7,960 0 0
Oxford	7,653 0 0
Taylor	7,377 0 0
Langmead & Way	7,330 0 0
Gibbs & Flew	7,300 0 0
Cook	7,233 0 0
Grimwood & Sons	6,693 0 0
Shurmur	6,673 0 0
Anley	6,642 0 0
Godden	6,590 0 0
Lamble	6,557 0 0
J. Beale	6,500 0 0
Pickersgill Bros. (accepted)	6,469 0 0

For the erection of an ambulance station at Deptford Hospital, New Cross-road. Messrs. Henry Jarvis & Son, architects:—

W. & H. Castle	£2,854 0 0
A. & F. Smith	2,715 0 0
Hunt & Challis	2,570 0 0
J. W. Sawyer	2,500 0 0
W. Brass	2,456 0 0
W. S. Josolyne	2,456 0 0
E. P. Mills	2,397 0 0
Rowse	2,367 0 0
Martin & Goddard	2,356 0 0
J. Marsland	2,345 0 0
W. Shepherd	2,290 0 0
W. Downs	2,258 0 0
H. L. Holloway	2,250 0 0
G. Parker	2,250 0 0
Aldridge and Jenvey	2,224 0 0
Tarrant & Son	2,176 0 0
G. W. Sly	2,176 0 0
H. W. Lorden & Son	2,175 0 0
W. & F. Croaker	2,109 0 0
Lonergan Bros.	2,096 0 0
J. Ivory	2,035 0 0
Wall Bros. (accepted)	1,998 0 0
A. J. Smith	1,990 0 0
R. L. Wood	1,845 0 0

For alterations to the Bancroft Arms, Mile End-road, for Mr. F. Garner. Mr. Edward Brown, architect, 18, Hanbury-street, Spitalfields:—

E. Lancaster	£383 0 0
S. W. Hawkings	371 0 0
Belcher & Ullmer	310 0 0
C. Marr (accepted)	294 0 0

For pewterer's work to the Tottenham Distillery, Tottenham Court-road, for Mr. Hyams. Mr. Edward Brown, architect:—

Watts & Co.	£215 0 0
T. Heath	201 3 0
W. J. Paddon (accepted)	171 10 0

Accepted for two shops and warehouse, Halifax. Mr. T. L. Patchett, architect, Halifax. Quantities supplied:—
H. Jenkinson (Mason and Bricklayer).
Messrs. Murgatroyd (Carpenter and Joiner).
John Naylor (Plumber and Glazier).
Rushworth & Firth (Plasterer and Slater).

For providing and laying 1,200 yards fireclay socket-pipes, for under drainage at Bishopwearmouth Cemetery, and cleansing existing drains, for the Bishopwearmouth Burial Board. Quantities supplied. Mr. J. E. Prosser, architect, Sunderland:—

T. P. Shaftoe, Sunderland	£403 7 4
A. Smith, Lintz Green	384 14 6
W. Kirk, Gateshead	308 13 6
G. Moir, Sunderland	275 17 6
W. Marshall, South Shields	271 19 0
J. Tough, Sunderland	221 10 7
Connley & A. Tough, Sunderland	220 10 11½
R. Allison, Whitburn	200 5 5
G. H. Humble, Sunderland	190 3 0
J. Stokoe, Fence Houses	181 12 3
P. Gleeson, Sunderland	177 0 0
T. Dixon, Stot's Pastures, Fence Houses (accepted)	162 10 0

For paving stables, open yard, covered gateway, &c. for Mr. F. D. Collen, at 84, Paradise-street, Rotherhithe. Mr. E. Crosse, surveyor, 32, Bermondsey-square :—

	Materials.	Total quantity.	Amount.
Almond, J., Bermondsey	In granite pitchers, kerbs, trams, &c., on concrete bed	395 yards	£268 5 0
Lemon, G., Sydenham	In granite pitchers, kerbs, and trams, stable paving, bricks, &c., on concrete	,,	258 5 0
Bullers, J., Bermondsey	In granite pitchers and kerbs, stable paving, bricks, &c., on concrete	,,	164 13 0
Carey, Sons, & Co., Bermondsey	In granite pitching, kerbing, blue bricks, and part wood blocks, and all on concrete	,,	152 2 0
Chafen, S., Rotherhithe	In granite pitching, trams, kerbing, &c., and concrete bed	,,	149 5 0
Stodart & Co., Cannon-street	Seyssel asphalte and kerbing, &c., concrete added	,,	143 13 0
Wells, B., Bermondsey	In blue Staffordshire bricks, grooved for stable only, granite or York trams and kerbs, and concrete	,,	122 3 0
Wilkinson & Co., Newcastle-on-Tyne*	In improved granite, concrete paving, part 2 in. and part 3 in. thick, on bed of broken bricks	,,	113 4 0
Hobman & Co., Peckham	In limestone tar paving, 4 in. thick, on bed of hard core, granite trams and kerbs added	,,	108 15 0

* Accepted, subject to a discount for cash.

For the erection of new, and enlargement of present, school buildings at Albany-row (Lambeth division), for the School Board for London. Mr. E. R. Robson, architect :—

Larter & Son	£9,345 10 0
Chappell	8,957 14 0
Steel	8,370 11 0
Lathey Bros.	8,269 0 0
Hart	8,078 0 0
Hobson	7,983 0 0
Pritchard	7,831 0 0
Shurmur	7,745 0 0
Shepherd	7,493 0 0
Higgs & Hill	7,449 0 0

For the erection of workshops and wood-chopping shed, &c., at the Brentwood Industrial School, for the School Board for London. Mr. E. R. Robson, architect :—

Robey	£1,040 0 0
F. & F. J. Wood	1,038 0 0
W. Wood	1,010 0 0
Cox	959 0 0
Atherton & Latta	938 0 0
W. Shurmur	891 0 0

For erecting villa at Pemberton Gardens, Upper Holloway. Mr. William Paice, architect :—

Eldridge	£760 0 0
Sawyer	750 0 0
Whitlet	675 0 0
J. Beales	669 0 0
J. Dye	500 0 0

For rebuilding church at Essendon, near Hatfield :—

		Old Materials.
Gregory, Clapham Junction	£3,744	£120
Hunt, Hoddesdon	3,785	161
Macey & Sons	3,620	70
Ekins & Son, Bengeo	3,700	200
Foster, Bedford	3,581	166
Gibbons & Co., Buntingford*	3,387	108

* Accepted.

For the formation of a new road through Bosgrove Park, Chingford, Essex. Mr. William Stair, surveyor :—

Falkner	£868 0 0
Maxwell & Son	849 0 0
Jesse Jackson	749 0 0
Rook	690 0 0

For repairs and alterations to eight houses and shops in High-street, Camden Town. Messrs. Farebrother, Ellis, Clarke, & Co., architects :—

Downs	£2,864 0 0
Johnson	1,747 0 0
Goad	1,684 0 0
King	1,680 0 0

For works in alteration to The Rose public-house, Wimpole-street, Cavendish-square, for Mr. C. J. Schwarz. Mr. Thomas Durrans, architect :—

C. E. Birch	£470 0 0
G. Phillips	398 0 0
J. Adams	359 0 0
J. H. Johnson	297 0 0

For warming and ventilating, by their new Hydro-Caloric Apparatus, the Westminster Jews' Free Schools, Hanway-street. Mr. H. H. Collins, architect :—

J. Weeks & Co., Chelsea	£276 0 0

TO CORRESPONDENTS.

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